# **NASA**AD-A278 849

Earth Resources
A Continuing
Bibliography
with Indexes

NASA SP-7041 (55) November 1987

National Aeronautics and Space Administration



DTIC ELECTE MAY 04 1994 G

es Earth Reso s Earth Resou Earth Resources n Resou Resources Ear rces Ear ces Earth

### **ACCESSION NUMBER RANGES**

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series) N87-20171 - N87-25266

IAA (A-10000 Series) A87-31363 — A87-42684

This supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A06.

### **EARTH RESOURCES**

# A CONTINUING BIBLIOGRAPHY WITH INDEXES

### Issue 55

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between July 1 and September 30, 1987 in

- Scientific and Technical Aerospace Reports (STAR)
- International Aerospace Abstracts (IAA).

Accesio	n For			
NTIS	CRA&I	pl .		
DTIC	TAB	面		
Unannounced				
Justification				
By Distribution /				
Availability Codes				
Dist	Avail and for Special			
A-1				

94-13358

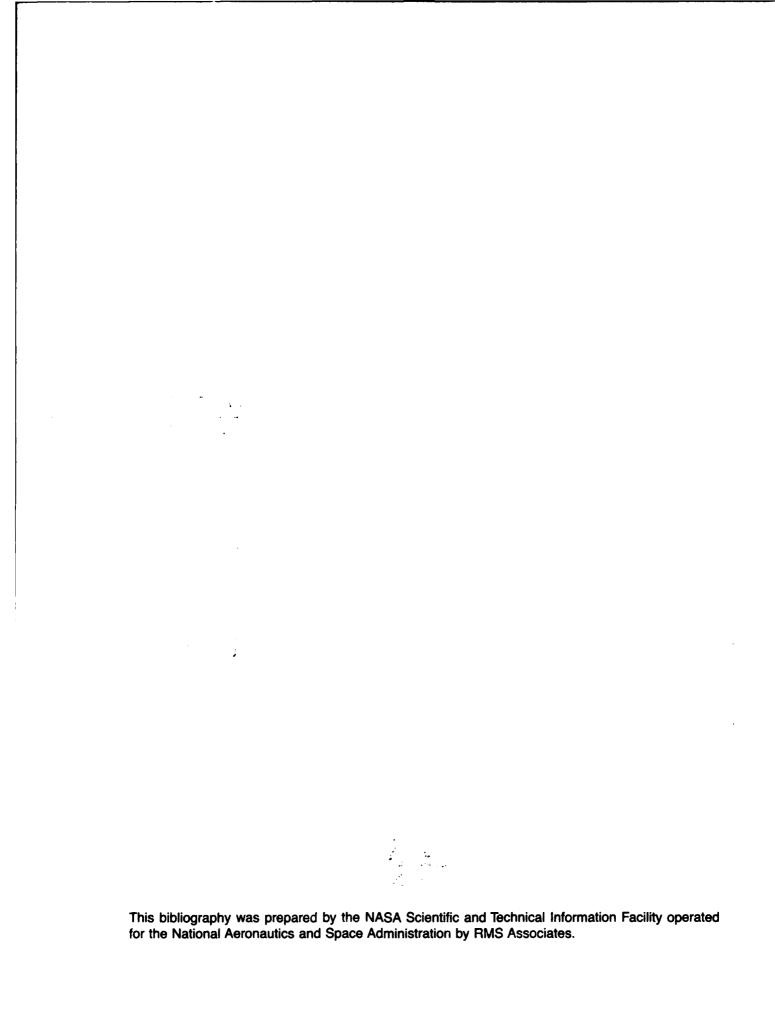


DTIC QUALITY Indiana

NVSV

Scientific and Technical Information Division 1987
National Aeronautics and Space Administration
Washington, DC

94 5 03 097



### INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the Earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the Earth's lands and waters, by sensing instrumentation on orbiting spacecraft or on aircraft.

This literature survey lists 368 reports, articles, and other documents announced between July 1 and September 30, 1987 in *Scientific and Technical Aerospace Reports (STAR)*, and *International Aerospace Abstracts (IAA)*.

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techiques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography are also included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations include the original accession numbers from the respective announcement journals.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

IAA entries identified by accession number series A87-10,000 in ascending accession number order:

STAR entries identified by accession number series N87-10,000 in ascending accession number order.

After the abstract section, there are seven indexes:

subject, personal author, corporate source, foreign technology, contract number, report/accession number, and accession number.

### **TABLE OF CONTENTS**

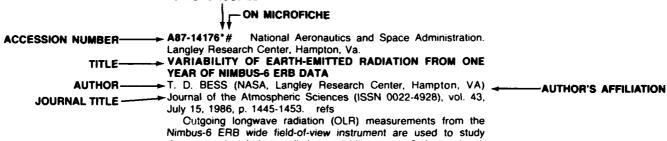
		Page
Includes tection,	Agriculture and Forestry crop forecasts, crop signature analysis, soil identification, disease deharvest estimates, range resources, timber inventory, forest fire detectively migration patterns.	1
	land use analysis, urban and metropolitan studies, environmental im- and water pollution, geographic information systems, and geographic	12
	Geodesy and Cartography mapping and topography.	14
	Geology and Mineral Resources mineral deposits, petroleum deposits, spectral properties of rocks, al exploration, and lithology.	17
	Oceanography and Marine Resources sea-surface temperature, ocean bottom surveying imagery, drift rates, and icebergs, sea state, fish location.	19
	Hydrology and Water Management snow cover and water runoff in rivers and glaciers, saline intrusion, analysis, geomorphology of river basins, land uses, and estuarine	34
Category 07 Includes and imag	Data Processing and Distribution Systems film processing, computer technology, satellite and aircraft hardware, gery.	36
Category 08 Includes	Instrumentation and Sensors data acquisition and camera systems and remote sensors.	43
Category 09 Includes	General economic analysis.	56
•		
	r Index	
•	ce indexlogy Index	
-	er Index	
	Index	
Accession Num	nber Index	G-1

### TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED ON MICROFICHE → N87-13900°# Pennsylvania State Univ., University Park. Dept. - CORPORATE SOURCE ACCESSION NUMBERof Meteorology. - ANALYSIS OF THE INFLOW AND AIR-SEA INTERACTIONS IN TITLE-**HURRICANE FREDERIC (1979) Final Report** - J. KAPLAN and W. M. FRANK Dec. 1986 119 p **AUTHORS** (Contract NAG5-398) -PUBLICATION DATE CONTRACT NUMBER (NASA-CR-180014; NAS 1.26:180014) Avail: NTIS HC A06/MF AVAILABILITY SOURCE **REPORT NUMBERS-**A01 CSCL 55C An unusually large amount of aircraft, rawinsonde, satellite, **COSATI CODE** ship and buoy data from hurricane Frederic (1979) are composited over a 40 hr period. These are combined with Frank's (1984) analysis of Frederic's core and Powell's (1982) surface wind analysis to analyze Frederic's three dimensional low level structure between the storm center and a radius of 10 deg. latitude. The analysis is improved significantly by determining the levels at which low level cloud motion winds (CMW's) are in the best agreement with verification wind data and then adjusting the winds to uniform analysis levels. Due to the unusually good low level wind resolution afforded by this data set, it is possible to obtain kinematically derived fields of vorticity, divergence and vertical velocity. These analyses are observed to be internally consistent and should prove useful for future analysis. Analysis of Frederic's surface to 560 m angular momentum budget beyond 2 deg. radius indicates that surface drag coefficients increase slightly with increasing radius and decreasing wind speed. Estimates of storm rainfall obtained by performing a moisture budget between the surface and the top of the inflow layer show that most storm rainfall falls inside about 4 deg. radius and that substantial underestimation of storm rainfall occurs when all low level CMW's are assigned to 560 m. Author

### TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

NASA SPONSORED



Cutgoing longwave radiation (OLR) measurements from the Nimbus-6 ERB wide field-of-view instrument are used to study daytime and nighttime radiation variability on a 15 deg regional, zonal, and global scale. An analysis of components of variance is used to determine how much of the total variability is due to between-region and within-region variance. Most of the analysis is on July and January data from one year of Nimbus-6 ERB. Different geographical scales are considered: regions within latitude zones and latitude zones within hemispheres. Results show that much of the variability is spatial, peaks in the tropics and subtropics, and is concentrated in the Northern Hemisphere. Daytime variability is generally larger than nighttime variability for July but not for January. Variance in OLR in the tropics and subtropics is largely a function of cloud variability.

# EARTH RESOURCES

### A Continuing Bibliography (Issue 55)

### **NOVEMBER 1987**

### 01

### **AGRICULTURE AND FORESTRY**

Includes crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventry, forest fire detection, and wildlife migration patterns.

A87-31411\*# National Aeronautics and Space Administration.
National Space Technology Labs., Bay Saint Louis, Miss.
MULTIPOLARIZATION SAR DATA FOR SURFACE FEATURE DELINEATION AND FOREST VEGETATION CHARACTERIZATION

SHIH-TSENG WU and STEVEN A. SADER (NASA, National Space Technology Laboratories, Bay Saint Louis, MS) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, Jan. 1987, p. 67-76. refs

This paper presents the utility of multipolarization Synthetic Aperture Radar (SAR) data for surface feature delineation and forest vegetation characterization. Three channels of radioed data (VV/HH, VH/HH, and VH/VV) are generated from the HH, VV, and VH polarization data (V = vertical, H = horizontal). The radioed data are linearly stretched to yield a digital number within a range of 0 to 255. The techniques for reducing SAR speckle noise and for measuring the degree of separation are discussed. For surface feature delineation, the results indicate that cross polarization as well as cross polarization radioed data better delineate those surface features that are difficult to separate by like polarization data. The results suggest using a median value filtering technique to reduce within-plot data fluctuation to increase the separability measure. For forest vegetation characterization, the results indicate that multipolarization SAR data may be used to estimate forest properties such as total-tree biomass, basal area, and tree height.

# A87-31413\* Michigan Univ., Ann Arbor. RELATING POLARIZATION PHASE DIFFERENCE OF SAR SIGNALS TO SCENE PROPERTIES

FAWWAZ T. ULABY, MYRON C. DOBSON, KYLE C. MCDONALD, THOMAS B. A. SENIOR (Michigan, University, Ann Arbor), and DANIEL HELD (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, Jan. 1987, p. 83-92.

This paper examines the statistical behavior of the phase difference Delta-phi between the HH-polarized and VV-polarized backscattered signals recorded by an L-band SAR over an agricultural test site in Illinois. Polarization-phase difference distributions were generated for about 200 agricultural fields for which ground information had been acquired in conjunction with the SAR mission. For the overwhelming majority of cases, the Delta-phi distribution is symmetric and has a single major lobe centered at the mean value of the distribution Delta-phi. Whereas the mean Delta-phi was found to be close to zero degrees for bare soil, cut vegetation, alfalfa, soybeans, and clover, a different pattern was observed for the corn fields; the mean Delta-phi increased with increasing incidence angle Theta = 35 deg. The explanation proposed for this variation is that the corn canopy,

most of whose mass is contained in its vertical stalks, acts like a uniaxial crystal characterized by different velocities of propagation for waves with horizontal and vertical polarization. Thus, it is hypothesized that the observed backscatter is contributed by a combination of propagation delay, forward scatter by the soil surface, and specular bistatic reflection by the stalks. Model calculations based on this assumption were found to be in general agreement with the phase observations.

A87-31414\*# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.

SIGNATURE-EXTENDABLE TECHNOLOGY - GLOBAL SPACE-BASED CROP RECOGNITION

FORREST G. HALL (NASA, Goddard Space Flight Center, Greenbelt, MD) and GAUTAM D. BADHWAR (NASA, Johnson Space Center, Houston, TX) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, Jan. 1987, p. 93-103. refs

The use of signature-extendable technology to improve the efficiency of machine processing of remotely sensed data is examined. Temporal profile technology is employed to automatically recognize crops; the technique uses the Kauth and Thomas (1976) transform of Landsat, multidata, and parameters derived from a model of each crop's greenness-time trajectory. The basic characteristics of temporal profile technology and the U.S. based labeling algorithm are described. Consideration is given to signature extension, signature-extendable spaces, and signature-extendable features. The greenness and brightness parameters used in temporal profile technology are derived. The signature extendability of the parameters is evaluated by applying them to the analysis of corn and soybean crops in the U.S. and Argentina. It is noted that the technique is an affordable and efficient method for deriving data on crops on a global basis.

### A87-32007

WORKSHOP ON SPACE REMOTE SENSING FOR AGRICULTURAL AND THEMATIC MAPPING, BUDAPEST, HUNGARY, APR. 18, 1986, PROCEEDINGS

Workshop sponsored by ESA. Frascati, Italy, Earthnet Programme Office, 1986, 122 p. For individual items see A87-32008 to A87-32010.

Papers are presented on the Earthnet program; remote sensing research in global agricultural productivity; and remote sensing application projects in the United Kingdom. Topics discussed include research activities in agriculture at the Joint Research Centre; remote sensing research and development results from agricultural applications in Hungary; remote sensing and crop production forecasting in Italy; and the use of remote sensing methods for yield forecasting. Consideration is given to remote sensing applications in Poland; the application of remote sensing to agricultural meteorology at the Meteorological Service in Hungary; and mapping crops and their probable water stress using satellite images for better irrigation management.

#### A87-32008#

### REMOTE SENSING RESEARCH IN GLOBAL AGRICULTURAL PRODUCTIVITY

M. F. BAUMGARDNER and C. S. T. DAUGHTRY (Purdue University, West Lafayette, IN) IN: Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings . Frascati, Italy, Earthnet Programme Office, 1986, p. 21-31. refs

Problems related to global agricultural productivity are discussed. The uses of remote sensing technology for resource management, in particular for assessing agricultural productivity and land resources, soil classification and mapping, and crop production estimation, are described. Consideration is given to population dynamics and the changing quantity and quality of land resources available for agricultural production.

#### A87-32009#

### REMOTE SENSING METHODS OF YIELD FORECASTING

D. HAMAR, CS. FERENCZ, J. LICHTENBERGER, GY. TARCSAI (Eotvos Lorand Tudomanyegyetem, Budapest, Hungary), and FERENCZ ARKOS (Budapesti Muszaki Egyetem, Budapest, Hungary) IN: Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings . Frascati, Italy, Earthnet Programme Office, 1986, p. 62-78. refs

A brief summary of yield forecasting methods, which are based on remotely sensed (spectral) data, is given. Emphasis is placed on the functional relationship between the different spectral data (or the agronomical variables derived from them) and the estimated yield.

Author

#### A87-32010#

# THE APPLICATION OF REMOTE SENSING IN AGRICULTURAL METEOROLOGY AT THE METEOROLOGICAL SERVICE OF THE HPR

P. BOZO, V. VADASZ, L. KETSKEMETY, M. PUTSAY, S. LESZTAK (Orszagos Meteorologiai Szolgalat, Budapest, Hungary) et al. IN: Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings. Frascati, Italy, Earthnet Programme Office, 1986, p. 87-103. Research supported by the Committee for Technological Development, Hungarian Water Management Authority, Magyar Tudomanyos Akademia, and Meteorological Service. refs

The use of remote sensing for agricultural meteorology in Hungary is discussed. The interpretation of thermal digital satellite images is examined; methods for geographical rectification and the elimination of atmospheric distortion are proposed. The application of remote sensing to agrometeorological yield estimation is considered. The relationship between plant parameters and remotely sensed data is investigated. Satellite image correction procedures, and the clustering and classification of images are described.

### A87-32090

# INFLUENCE OF DIFFERENT NITROGEN AND IRRIGATION TREATMENTS ON THE SPECTRAL REFLECTANCE OF BARLEY

JOHAN KLEMAN and ERIK FAGERLUND (Stockholm, Universitet, Sweden) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, Feb. 1987, p. 1-14. Research supported by the Swedish Board for Space Activities and Naturvetenskapliga Forskningsradet. refs

The information contained in the 0.4-2.4 micron range of a spectroradiometer was evaluated with the aim of finding information parameters different from the IR/red ratio and the related parameters. Reflectance measurements, performed in a nadir looking direction from a mobile platform 15 m above ground, were carried out for twelve plots of barley treated at two irrigation and three fertilization levels; and the reflectance factors of single spectral bands, reflectance factor ratios, and color coordinates were analyzed in relation to the grain yield and the biomass and water content of the crop. The blue color coordinate Z was the only spectral parameter with potential for discriminating between

the irrigation treatments. The average IR/red ratio during the middle of the season was strongly coupled to the grain yield two months later, but when senescence had started, the R(0.80)/R(1.65) ratio offered a greater potential for grain yield prediction. The reflectance factor R(2.19) decreased with increasing canopy water content up to 800-100 g/sq m, after which an asymptotic reflectance was reached.

#### A87-32091

### CALIBRATION OF SATELLITE RADIOMETERS AND THE COMPARISON OF VEGETATION INDICES

JOHN C. PRICE (USDA, Remote Sensing Research Laboratory, Beltsville, MD) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, Feb. 1987, p. 15-27. refs

Satellite technology provides a steadily improving capability to monitor surface land use and vegetation. However, the increasing number of satellite sensors has led to a variety of spectral indices which may be used to characterize vegetation. A basis is developed for comparing results from different sensors using instrument calibration coefficients, and the derived radiances are related to reflectances, principal component variables such as greenness, and spectral vegetation indices.

### A87-32093\* New York State Univ., Binghamton.

# ESTIMATION OF CANOPY PARAMETERS OF ROW PLANTED VEGETATION CANOPIES USING REFLECTANCE DATA FOR ONLY FOUR VIEW DIRECTIONS

NARENDRA S. GOEL and TOBY GRIER (New York, State University, Binghamton) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, Feb. 1987, p. 37-51. NASA-supported research. refs

A procedure for estimating leaf area index (LAI) and percentage of ground cover (GC) for inhomogeneous row planted vegetation canopies using measurement of canopy reflectance (CR) data for only four directions is presented. This procedure, referred to as 'reconstructive inversion', uses the CR data for these directions to first 'reconstruct' the complete bidirectional surface, which is then used to estimate the canopy parameters using the standard inversion of a CR model technique. The technique has been successfully applied to soybeam and corn canopies in various stages of growth.

### A87-32094

### HABITAT MAPPING BY LANDSAT FOR AERIAL CENSUS OF KANGAROOS

GREG J. E. HILL (Queensland, University, Brisbane, Australia) and GAIL D. KELLY (Department of Mapping and Surveying, Remote Sensing Unit, North Quay, Australia) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, Feb. 1987, p. 53-60. Research supported by the University of Queensland and Department of Mapping and Surveying. refs

Landsat MSS imagery was used to map habitat categories used in connection with aerial census work that estimates population levels of kangaroos. A study area featuring typical habitat patterns was selected in the marginal wheat lands of southern, inland Queensland. A series of unsupervised classifications of the imagery provided accurate estimation of the relative proportions and distribution of these habitats. The data form a useful base for programmes that: monitor the numbers and distribution of kangaroos; and attempt to refine aerial census methodology.

Author

**A87-32095\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

### CONTINENTAL LAND COVER ASSESSMENT USING LANDSAT WSS DATA

ROSS NELSON (NASA, Goddard Space Flight Center, Greenbelt, MD), DAVID CASE, NED HORNING (Science and Applications Research, Inc., Riverdale, MD), VIRGIL ANDERSON, and SREE PILLAI (Purdue University, West Lafayette, IN) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, Feb. 1987, p. 61-81.

A statistical procedure to assess level-II continental resources using Landsat MSS digital data is presented. The statistical procedure involves a two-stage cluster sample within a stratified andom sample. The utility of this procedure is assessed by using t to estimate the areal extent of the conifer and hardwood resources of the continental U.S. National estimates of conifer and hardwood derived using this sampling procedure were within 3 percent of U.S. Forest Service (USFS) figures. According to the \_andsat-based study, 11 percent of the country is conifer forest and 12 percent is hardwood. The corresponding USFS figures are 13 and 15 percent, respectively. Comparison of the MSS classification products and airphotos showed that the conifer cover class was correctly identified 74 percent of the time and hardwood 30 percent of the time. The average classification accuracy countrywide for the four cover types considered (conifer, hardwood, water, and 'other') is 74 percent, and the overall accuracy is 85 percent. The statistical procedure provides a method of ncorporating Landsat MSS digital data as a second state for level-II continental resource assessment. Alternate data sources, e.g., satellite and aircraft photographic imagery, may also be used in conjunction with this statistical model.

A87-32098\* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex. LANDSAT CLASSIFICATION OF ARGENTINA SUMMER CROPS

G. D. BADHWAR (NASA, Johnson Space Center, Houston, TX), C. E. GARGANTINI, and F. V. REDONDO (Comision Nacional de nvestigaciones Espaciales, Centro de Sensores Remotes, Buenos Aires, Argentina) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, Feb. 1987, p. 111-117. refs

A Landsat MSS and TM classification approach based on three 'eatures derived from the greenness profile has proved very effective in separating and identifying corn, soybeans, and other ground cover classes in the U.S. The objective of this study is to nvestigate the separation of summer crops in Argentina, one of the most important commodity exporters, using the same greenness profile features that have proved effective in the U.S. Corn Belt. The area chosen for study is a more complex cropping practice area located in the north-west corner of Buenos Aires province in Pampa Humeda, where corn, soybean, sorghum, sunflower, and pastures are cultivated. It is shown that the profile features can provide very effective separation, except in the case of corn from sorghum. Separation between corn and soybeans was found to be greater than in the U.S. This study suggests that the automatic, unsupervised classification approach developed in the U.S., with elatively minor modification, can be used for summer crop area estimation in Argentina.

### **487-32495**

### 3LOBAL VEGETATION MONITORING USING NOAA VEGETATION INDEX DATA

HARUHISA SHIMODA, KIYONARI FUKUE, TSUKASA HOSOMURA, and TOSHIBUMI SAKATA (Tokai University, Tokyo, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1625-1630.

The method for deriving a global vegetation map from the VOAA-AVHRR vegetation index data (VID) is presented, using a pne-week data set of AVHRR measurements. Daytime data were sampled and mosaicked by the lowest radiance principle, thus sliminating most cloud cover from the results. Large shading effects caused by the sun-angle deviations were eliminated using a

luminance-of-the-earth-surface equation. The classification was executed using a maximum likelihood method with four channels of VID. Training areas, composed of 67 categories, were selected from the World Vegetation Map of James et al. (1981); after the classification, these 67 categories were unified to 17 general categories, and the classified image was transformed to longitude and latitude coordinates. The results have demonstrated the suitability of the NOAA VID for worldwide vegetation monitoring, although the remaining clouds are still a problem.

#### A87-32498

### RELATION BETWEEN PRECIPITATION AND BRIGHTNESS OF EARTH SURFACE IN THE NOAA/GVIP DATA

YASUNORI NAKAYAMA and SOTARO TANAKA (Remote Sensing Technology Center of Japan, Tokyo) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2 . Tokyo, AGNE Publishing, Inc., 1986, p. 1643-1650.

Brightness of the earth surface seen in the data of NOAA/GVIP is related to the precipitation at the land. This statistical law was found by comparing the GVIP data with the corresponding precipitation data. The correlation coefficients were 0.85 and 0.84 in the case of global data in 1983 and 1984. Also correlation coefficient of 0.89 was obtained in the case of Lake Chad area.

Author

#### A87-32954

### REFLECTANCE CHARACTERISTICS AND ITS APPLICATION IN THE CLASSIFICATION OF NIGERIAN SAVANNA SOILS

AYODELE FAGBAMI (Ibadan, University, Nigeria) Geocarto International, no. 4, 1986, p. 39-47. refs

**A87-33298\*** Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).

EVALUATION OF A SURFACE/VEGETATION PAFAMETERIZA-TION USING SATELLITE MEASUREMENTS OF SURFACE TEM-PERATURE

O. TACONET, T. CARLSON, R. BERNARD, and D. VIDAL-MADJAR (Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Issy-les-Moulineaux, France) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 25, Nov. 1986, p. 1752-1767. CNES-CNRS-supported research. refs (Contract NAG5-1&4)

Ground measurements of surface-sensible heat flux and soil moisture for a wheat-growing area of Beauce in France were compared with the values derived by inverting two boundary layer models with a surface/vegetation formulation using surface temperature measurements made from NOAA-AVHRR. The results indicated that the trends in the surface heat fluxes and soil moisture observed during the 5 days of the field experiment were effectively captured by the inversion method using the remotely measured radiative temperatures and either of the two boundary layer methods, both of which contain nearly identical vegetation parameterizations described by Taconet et al. (1986). The sensitivity of the results to errors in the initial sounding values or measured surface temperature was tested by varying the initial sounding temperature, dewpoint, and wind speed and the measured surface temperature by amounts corresponding to typical measurement error. In general, the vegetation component was more sensitive to error than the bare soil model.

A87-33441\* Woods Hole Oceanographic Institution, Mass.
DEFORESTATION IN THE TROPICS - NEW MEASUREMENTS
IN THE AMAZON BASIN USING LANDSAT AND NOAA
ADVANCED VERY HIGH RESOLUTION RADIOMETER
IMAGERY

G M WOODWELL (Woods Hole Research Center, MA), R. A. HOUGHTON T A STONE (Marine Biological Laboratory, Woods Hole, MA) R F NELSON (NASA, Goddard Space Flight Center, Greenbelt, MD), and W KOVALICK (Science Applications Research, Lanham, MD), Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 20, 1987, p. 2157-2163. Research supported by the Woods Hole Research Center, refs (Contract DE-AC05-840R-21400)

#### A87-35119

### GLAI ESTIMATION USING MEASUREMENTS OF RED, NEAR INFRARED, AND MIDDLE INFRARED RADIANCE

P. J. CURRAN and H. D. WILLIAMSON (Sheffield, University, England) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, Feb. 1987, p. 181-186. refs (Contract NERC-GR/3/5096)

The passive remote sensing of green leaf area index (GLAI) has utilized measurements of red (R) and near-infrared (NIR) radiance. Increased availability of mid-infrared (MIR) radiance data (e.g., 1.55 to 1.75 microns, from Landsat TM band 5) and the correlation between MIR radiance and GLAI has encouraged the use of these wavelengths for GLAI estimation. The aim of this paper is twofold; first, to refine the methodology used for such GLAI estimation, and second, to assess the effect of incorporating MIR radiance data into this methodology. Empirical models based upon airborne multispectral scanner measurements of R, NIR, and MIR radiance were inverted, and the GLAI of grassland was estimated to an accuracy of 18 to 58 percent (95 percent confidence level) for five levels of GLAI and + or - 0.48 to 0.75 GLAI for a point. Refinement of the methodology increased the accuracy to 60 to 85 percent (95 percent confidence level) for five levels of GLAI and - or - 0.09 to - or - 0.12 GLAI for a point. The empirical models provided significantly similar estimates of GLAI regardless of the contribution of MIR radiance. It was concluded that measurements of MIR radiance added little extra information to measurements of R and NIR for the purposes of GLAI estimation. Author

#### A87-35120

### IDENTIFYING VEGETABLE CROPS WITH LANDSAT THEMATIC MAPPER DATA

VICKI L. WILLIAMS, WARREN R. PHILIPSON, and WILLIAM D. PHILPOT (Cornell University, Ithaca, NY) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, Feb. 1987, p. 187-191. refs

(Contract USDA-58-319T-3-0Z08X)

Landsat thematic mapper (TM) data were evaluated for inventorying or monitoring New York State vegetables, which are grown commercially in organic (muckland) or mineral (upland) soils. in fields as small as 2 hectares. Two TM scenes of west-central New York, acquired in July and August 1984, were analyzed digitally with spectral characterizations, enhancements, and supervised classifications being referenced to field-measured reflectances and cropping records. Testing showed single-date classification accuracies of at least 90 percent for three muckland vegetables (onions, lettuce, potatoes), and over 75 percent for three of four upland vegetables (cabbage, sweet corn, potatoes, and mature, but not young, snap beans) for TM data acquired late in the growing season. In addition, visual image analysis of the digitally displayed TM data was capable of easily identifying most of the mature crops studied. Overall, either digital or visual image analysis seems capable of producing reliable classifications of vegetable crops

A87-35121\* National Aeronautics and Space Administration National Space Technology Labs., Bay Saint Louis, Miss

FOREST BIOMASS, CANOPY STRUCTURE, AND SPECIES COMPOSITION RELATIONSHIPS WITH MULTIPOLARIZATION L-BAND SYNTHETIC APERTURE RADAR DATA

STEVEN A. SADER (NASA, National Space Technology Laboratories, Bay Saint Louis, MS) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, Feb. 1987, p 193-202. NASA-supported research. refs

The effect of forest biomass, canopy structure, and species composition on L-band synthetic aperature radar data at 44 southern Mississippi bottomland hardwood and pine-hardwood forest sites was investigated. Cross-polarization mean digital values for pine forests were significantly correlated with green weight biomass and stand structure. Multiple linear regression with five forest structure variables provided a better integrated measure of canopy roughness and produced highly significant correlation coefficients for hardwood forests using HV/VV ratio only. Differences in biomass levels and canopy structure, including branching patterns and vertical canopy stratification, were important sources of volume scatter affecting multipolarization radar data. Standardized correction techniques and calibration of aircraft data, in addition to development of canopy models, are recommended for future investigations of forest biomass and structure using synthetic aperture radar.

#### A87-35122

### A COMPARISON OF OPTICAL BAR, HIGH-ALTITUDE. AND BLACK-AND-WHITE PHOTOGRAPHY IN LAND CLASSIFICATION

CHARLES T. SCOTT, HANS T. SCHREUDER (USDA, Northeastern Forest Experiment Station, Broomall, PA), and DOUGLAS M. GRIFFITH (USDA, Rocky Mountain Forest and Range Experiment Station, Ft. Collins, CO) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, Feb. 1987, p. 203-206. refs

For large-area forest surveys, 1981-84 color infrared national high-altitude program (NHAP) and 1983 optical bar color (OBC) infrared photography resulted in equally precise estimates of land-use/land-cover area. Both were only slighly more precise than 1970 black-and-white photography. OBC was the least cost effective because optical bar imagery is usually flown specifically for a survey, whereas NHAP and older black-and-white photography are readily available. Optical bar photography can be used effectively up to 35 degrees from nadir.

Author

### A87-35307

### THE TOPOGRAPHIC EFFECT ON LANDSAT DATA IN GENTLY UNDULATING TERRAIN IN SOUTHERN SWEDEN

KARIN HALL-KONYVES (Lund, Universitet, Sweden) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 157-168. Research sponsored by the Swedish Board for Space Activities. refs

The purpose of this study was to investigate the effect of topography on Landsat satellite data in gently undulating terrain. Gently undulating terrain is in this work defined as terrain dominated by slopes of between 1 and 15 deg. For three various solar elevations (38, 44 and 52 deg) digital Landsat MSS and TM data were merged with digital elevation data. In an agricultural region in southern Sweden 135 cultivated fields, 50 pasture sites and 117 forest sites with a total number of 88,800 pixels were studied. The relationship between Landsat response variation and topographic parameters within cultivated fields and forest areas was weak. For some pasture covers a topographic effect was identified.

187-35309\* National Aeronautics and Space Administration. ioddard Space Flight Center, Greenbelt, Md.

IUANTIFYING SPATIAL AND TEMPORAL VARIABILITIES OF IICROWAVE BRIGHTNESS TEMPERATURE OVER THE U.S. OUTHERN GREAT PLAINS

J. CHOUDHURY, M. OWE, J. P. ORMSBY, A. T. C. CHANG, R. WANG (NASA, Goddard Space Flight Center, Greenbelt, ID), S. N. GOWARD (Maryland, University, College Park), and R. GOLUS (Science Applications Research, Lanham, MD) ternational Journal of Remote Sensing (ISSN 0143-1161), vol., Feb. 1987, p. 177-191. refs

Spatial and temporal variabilities of microwave brightness emperature over the U.S. Southern Great Plains are quantified in arms of vegetation and soil wetness. The brightness temperatures FB) are the daytime observations from April to October for five ears (1979 to 1983) obtained by the Nimbus-7 Scanning lultichannel Microwave Radiometer at 6.6 GHz frequency. orizontal polarization. The spatial and temporal variabilities of egetation are assessed using visible and near-infrared bservations by the NOAA-7 Advanced Very High Resolution adiometer (AVHRR), while an Antecedent Precipitation Index (API) iodel is used for soil wetness. The API model was able to account or more than 50 percent of the observed variability in TB, although near correlations between TB and API were generally significant t the 1 percent level. The slope of the linear regression between B and API is found to correlate linearly with an index for vegetation ensity derived from AVHRR data.

### 87-35310

### OME OBSERVATIONS ON CROP PROFILE MODELLING

. A. CAMPBELL, E. S. DE BOER (CSIRO, Div. of Mathematics nd Statistics, Wembley, Australia), and P. T. HICK (CSIRO, Div. f Groundwater Research, Wembley, Australia) International purnal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, 193-201. Research supported by the Cooperative Bulk andling refs.

Landsat data are typically available for a number of overpasses uring a growing season. There is currently considerable interest modeling the so-called crop profile for such multitemporal data y a nonlinear profile function of some (spectral) index for the pectral bands. The derived coefficients are used in a subsequent location procedure. This paper outlines some results obtained om an evaluation of the approach for crop data from the wheatbelt f Western Australia. Specifically, the degree of separation of crop asses from pasture classes, as measured by the discriminant iot, is compared for analyses based on the original bands, on arious spectral indices and on fitted coefficients from a crop rofile function describing the temporal change in these indices. or the data considered, a marked loss of discrimination is found ir analyses based on various spectral indices, when compared ith those based directly on the corresponding discriminant nctions (where the linear combination is not constrained to be ie same for each time). Analysis of the coefficients for the onlinear profile functions fitted to the indices results in further ss of separation. Author

### **B7-35312**

# COMPARISON OF SUPERVISED MAXIMUM LIKELIHOOD AND ECISION TREE CLASSIFICATION FOR CROP COVER STIMATION FROM MULTITEMPORAL LANDSAT MSS DATA

S. BELWARD (Cranfield Institute of Technology, Silsoe, England) and A. DE HOYOS (Oxford University, England) International purnal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, 229-235. Research supported by the Fundacao de Amparo a esquisa do Estado de Sao Paulo and British Council. refs

# A87-35520\* Department of Agriculture, Beltsville, Md. SALINITY EFFECTS ON THE MICROWAVE EMISSION OF SOILS

THOMAS J JACKSON (USDA, Hydrology Laboratory, Beltsville, MD) and PEGGY E. ONEILL (NASA, Goddard Space Flight Center, Greenbelt, MD) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 214-220. Previously announced in STAR as N87-17302. refs

Controlled plot experiments were conducted to collect L and C band passive microwave data concurrent with ground observations of salinity and soil moisture. The dielectric mixing models were used with an emission model to predict the emissivity from a bare smooth uniform profile. The models produce nearly identical results when near zero salinity is involved and reproduce the observed data at L band extremely well. Discrepancies at C band are attributed to sampling depth problems. Comparisons of predicted emissivities at various salinities with observed values indicate that the dynamic range of the emissivities can be explained using either of the dielectric mixing models. Evaluation of the entire data set, which included four salinity levels, indicates that for general application the effects of soil salinity can be ignored in interpreting microwave data for estimating soil moisture under most agricultural conditions.

#### A87-35521

### A SOIL THERMAL MODEL FOR REMOTE SENSING

DIEM HO (IBM France, S.A., Paris) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 221-229. Research supported by IBM France, S.A., CNES, and CNRS. refs

A simulation model of heat exchange at the soil surface is used to study the effects of the soil characteristics, the initial temperature profile, and the boundary conditions on the surface temperatures. The surface temperature cycle is found to be insensitive to both the initial temperature profile and the lower boundary conditions. The result makes it possible to treat the soil with an analytic steady-state model as a transmission line problem. Its formulation allows the calculation of the soil conducting flux directly from satellite temperature data, without the knowledge of the energy exchange process at the ground surface, provided that the soil thermal inertia is known. A simple inverse model can then be formulated to calculate accurately the soil thermal inertia and soil fluxes using visible and infrared satellite data. The model requires neither the linearization of the flux terms at the ground surface nor the knowledge of the lower boundary condition and the soil initial temperature profile.

#### A87-36109

STATISTICAL EVALUATION OF FOREST CHARACTERISTICS FROM AERIAL AND SPACE PHOTOGRAPHS [STATISTICHES-KOE OTSENIVANIE KHARAKTERISTIK LESNYKH OB'EKTOV PO AERO- I KOSMICHESKIM SNIMKAM]

R. I. ELMAN, L. A. KUZENKOV, and N. A. APARINOVA (Vsesoiuznoe Aerofotolesoustroitel'noe Ob'edinenie Lesproekt, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 105-112. In Russian. refs

A method of computer-aided statistical evaluation of forest taxation indices (the forest age, height, diameter, density, and growing stock) from aerial and space photographs is discussed. Procedures for estimating the statistical significance and the efficiency of the results obtained are described along with the verification methods. Using this methodology, estimates of the information content of landscape signatures are obtained from aerial and space photographs, together with the principal taxation indices of the forests in these photographs.

#### A87-36579

AERIAL AND SPACE INVESTIGATIONS OF SOILS AND VEGETATION (AEROKOSMICHESKIE ISSLEDOVANIIA POCHV I RASTITEL'NOSTI)

KIRILL IAKOVLEVICH KONDRATEV, VLADIMIR VASILEVICH KOZODEROV, and PETR PETROVICH FEDCHENKO Leningrad, Gidrometeoizdat, 1986, 232 p. In Russian. refs

Results of theoretical and experimental studies on the identification and evaluation of soils and vegetation covers using ground, airborne, and spaceborne measurements are presented. The principles underlying the evaluation studies of ground cover from the spectral reflectances are discussed, and several empirical methods of soil and plant identification and classification are examined. Equations relating the remote sensing data with the humus content of the soil, the chlorophyll content of plant leaves, weed populations, and the percentage of ruined plants in a winter crop field are presented.

#### A87-36946

RECONNAISSANCE OF VEGETAL FORMATIONS IN A GUINEAN FOREST SECTOR BY MEANS OF LANDSAT IMAGES [RECONNAISSANCE DES FORMATIONS VEGETALES DU SECTEUR FORESTIER GUINEEN A PARTIR DES IMAGES LANDSAT]

MYRIAM ARMAND (Ministere de l'Education Nationale, Bureau des Innovations Pedagogiques et des Technologies Nouvelles, Paris, France) Societe Francaise de Photogrammetrie et de Teledetection, Bulletin (ISSN 0244-6014), no. 103, 1986, p. 33-49. In French. refs

A 1974 Landsat image of a region of the Ivory Coast was digitally processed and the results were compared with available ground truth and airborne photography data. The area is of particular interest because of the drought conditions which have been prevalent in that region of Africa for more than a year, and the concommitant need to monitor the encroachment of desert and human population on arable and forested lands. The 1:200,000 scale Landsat image was used to establish 10 different classes of vegetation in an area which included the interface between a savannah and a forest. Sample tricolor images are provided, along with radiometric histograms from the Landsat channels that were used to develop the different classification indices.

### A87-37054

### AN APPLICATION OF LOW ALTITUDE MULTISPECTRAL PHOTOGRAPHY TO AGRICULTURAL FIELD TRIALS

JAN G. P.W. CLEVERS (Landbouwhogeschool, Wageningen, Netherlands) and CHARLES HORTON (Polytechnic of Central London, London, England) ITC Journal (ISSN 0303-2434), no. 2, 1986, p. 131-139. refs

In agronomy, field trials are conducted to evaluate the influence of different crop treatments on, for example, leaf area index (LAI) and biomass. In the quantitative analysis, inaccuracies can be large because of small sample sizes; these are inevitable when frequent and destructive sampling must be used. In support of such field trials, an airborne multispectral photographic (MSP) system was designed and used as a low altitude data recording system. The results show the relative dispersion of data acquired by this method to be much smaller compared with agronomic data (e.g., LAI). Treatment effects are therefore more readily detected by MSP than by conventional field sampling methods. Infrared reflectance factors have potential use as an estimator of LAI. Consistency is demonstrated by using a method of calibration and data correction to derive canopy spectral reflectance factors. Low altitude multispectral photography can be used as an inexpensive nondestructive tool for routine spectral measurements in field trials, yielding more precise information about vegetation characteristics than conventional field sampling methods. Author A87-37278\* Maryland Univ., College Park.

CANOPY REFLECTANCE, PHOTOSYNTHESIS, AND TRANSPIRATION. II - THE ROLE OF BIOPHYSICS IN THE LINEARITY OF THEIR INTERDEPENDENCE

P. J. SELLERS (Maryland, University, College Park) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, March 1987, p. 143-183. refs (Contract NAG5-492)

The ability of satellite sensor systems to estimate area-averaged canopy photosynthetic and transpirative properties is evaluated. The near linear relationship between the simple ratio (SR) and normalized difference (ND) and the surface biophysical properties of canopy photosynthetically active radiation (PAR) absorption, photosynthesis, and bulk stomatal resistance is studied. The models utilized to illustrate the processes of canopy reflectance, photosynthesis, and resistance are described. The dependence of SR, the absorbed fraction of PAR, and canopy photosynthesis and resistance on total leaf area index is analyzed. It is noted that the SR and ND vegetation indices and vegetation-dependent qualities are near-linearly related due to the proportion of leaf scattering coefficient in visible and near IR wavelength regions. The data reveal that satellite sensor systems are useful for the estimation of photosynthesis and transpirative properties.

# A87-37279\* Science Applications Research, Lanham, Md. COMPUTATION OF DIFFUSE SKY IRRADIANCE FROM MULTIDIRECTIONAL RADIANCE MEASUREMENTS

SURAIYA P. AHMAD (Science Applications Research, Lanham, MD), ELIZABETH M. MIDDLETON, and DONALD W. DEERING (NASA, Goddard Space Flight Center, Greenbelt, MD) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, March 1987, p. 185-200. refs

(Contract NAS5-28200)

Accurate determination of the diffuse solar spectral irradiance directly above the land surface is important in characterizing the reflectance properties of these surfaces, especially vegetation canopies. This determination is also needed to infer the net radiation budget of the earth-atmosphere system above these surfaces. An algorithm is developed here for the computation of hemispheric diffuse irradiance using the measurements from an instrument called PARABOLA, which rapidly measures upwelling and downwelling radiances in three selected wavelength bands. The validity of the algorithm is established from simulations. The standard reference data set of diffuse radiances of Dave (1978), obtained by solving the radiative transfer equation numerically for realistic atmospheric models, is used to simulate PARABOLA radiances. Hemispheric diffuse irradiance is estimated from a subset of simulated radiances by using the algorithm described. The algorithm is validated by comparing the estimated diffuse irradiance with the true diffuse irradiance of the standard data set. The validations include sensitivity studies for two wavelength bands (visible, 0.65-0.67 micron; near infrared, 0.81-0.84 micron), different atmospheric conditions, solar elevations, and surface reflectances. In most cases the hemispheric diffuse irradiance computed from simulated PARABOLA radiances and the true irradiance obtained from radiative transfer calculations agree within 1-2 percent. This technique can be applied to other sampling instruments designed to estimate hemispheric diffuse sky irradiance. Author

A87-37281\* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

INFERRING SPECTRAL REFLECTANCES OF PLANT ELEMENTS BY SIMPLE INVERSION OF BIDIRECTIONAL REFLECTANCE MEASUREMENTS

J. OTTERMAN (NASA, Goddard Space Flight Center, Greenbelt, MD; Tel Aviv University, Israel), D. E. STREBEL (Science Applications Research, Lanham, MD), and K. J. RANSON (NASA, Goddard Space Flight Center, Greenbelt, MD) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, March 1987, p. 215-228. refs

(Contract NAS5-28200; NAS9-16528)

Inverting previously developed explicit expressions for a vertical architecture, bidirectional reflectances measured over corn viewing from the solar quadrant at azimuths near the principal plane are used to determine the spectral reflectances of plant elements. The leaf reflectance values extracted in three visible bands at viewing zenith angles of 70 deg, 60 deg, and 45 deg agree closely with laboratory-measured reflectances of corn leaves. At viewing zenith angle of 30 deg, the inversion breaks down, inasmuch as the inferred plant element reflectances are too high. Satisfactory results are also achieved when the same approach is applied to bidirectional reflectances measured over potted balsam firs, but when applied to soybeans reflectances, the procedure yields unreasonably high leaf reflectances. The failure in this case is attributed to the nonvertical architecture of the soybean canopy; however, for this canopy, inversion based on horizontal architecture is possible. The bidirectional reflectances measured from the solar quadrant, at viewing angles appreciably far from 'hot spot' viewing, approximately equal in magnitude half of the leaf reflectance. The 0.5 ratio is predicted by a previous analysis of opaque horizontal Lambertian facets, as the asymptotic value for a dense canopy at any viewing angle. For soybeans, this ratio applies very closely at 15 deg viewing zenith angle. The results suggest that inversion based on simple architecture, applying explicit expressions, might be of value, either in itself or as a preliminary step before inversion applying complex models.

### A87-37282

### LANDSAT AS AN AID IN EVALUATING THE ADEQUACY OF A GRAIN SILO NETWORK

L. A. SANDHAM (University of the North, Sovenga, Republic of South Africa) and P. A. J. VAN RENSBURG (Rand Afrikaans University, Johannesburg, Republic of South Africa) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, March 1987, p. 229-241. Research supported by the Council for Scientific and Industrial Research, and Oostelike Transvaalse Kooperaise. refs

First, Landsat MSS data were used to determine the area of cultivated cropland in a portion of the Eastern Highveld of the Transvaal, South Africa. A supervized Bayes maximum likelihood classification algorithm was applied resulting in classification accuracy above 75 percent for the study area. Second, the area of cropland thus obtained was combined with a spatially contoured surface of potential yield (per hectare) to determine the size of the potential crop of each silo service area. Third, the potential crop size was used to evaluate the adequacy of the existing silo capacity, thus serving as a possible input for planning extensions to the silo network.

A87-37827\* Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.

### DETECTION OF RIFT VALLEY FEVER VIRAL ACTIVITY IN KENYA BY SATELLITE REMOTE SENSING IMAGERY

KENNETH J. LINTHICUM, CHARLES L. BAILEY (U.S.Army, Medical Research Institute of Infectious Diseases, Frederick, MD), F. GLYN DAVIES (Veterinary Research Laboratory, Kabete, Kenya), and COMPTON J. TUCKER (NASA, Goddard Space Flight Center, Greenbelt, MD) Science (ISSN 0036-8075), vol. 235, March 27, 1987, p. 1656-1659. NASA-supported research. refs

Data from the advanced very high resolution radiometer on board the National Oceanic and Atmospheric Administration's polar-orbiting meteorological satellites have been used to infer ecological parameters associated with Rift Valley fever (RVF) viral

activity in Kenya. An indicator of potential viral activity was produced from satellite data for two different ecological regions in Kenya, where RVF is enzootic. The correlation between the satellite-derived green vegetation index and the ecological parameters associated with RVF virus suggested that satellite data may become a forecasting tool for RVF in Kenya and, perhaps, in other areas of sub-Saharan Africa.

# A87-38094\* Department of Agriculture, Beltsville, Md. TEMPORAL OBSERVATIONS OF SURFACE SOIL MOISTURE USING A PASSIVE MICROWAVE SENSOR

T. J. JACKSON (USDA, Agricultural Systems Research Institute, Beltsville, MD) and P. O'NEILL (NASA, Goddard Space Flight Center, Greenbelt, MD) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, April 1987, p. 281-296. refs

A series of 10 aircraft flights was conducted over agricultural fields to evaluate relationships between observed surface soil moisture and soil moisture predicted using passive microwave sensor observations. An a priori approach was used to predict values of surface soil moisture for three types of fields: tilled corn, no-till corn with soybean stubble, and idle fields with corn stubble. Acceptable predictions were obtained for the tilled corn fields, while poor results were obtained for the others. The source of error is suspected to be the density and orientation of the surface stubble layer; however, further research is needed to verify this explanation. Temporal comparisons between observed, microwave predicted, and soil water-simulated moisture values showed similar patterns for tilled well-drained fields. Divergences between the observed and simulated measurements were apparent on poorly drained fields. This result may be of value in locating and mapping hydrologic contributing areas.

#### A87-38095

### NADIR LOOKING AIRBORNE RADAR AND POSSIBLE APPLICATIONS TO FORESTRY

R. BERNARD, M. E. FREZAL, D. VIDAL-MADJAR (Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Issy-les-Moulineaux, F, D. GUYON, and J. RIOM (Institut National de la Recherche Agronomique, Cestras, France) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, April 1987, p. 297-309. refs

It is shown that investigators can use an airborne radar with high range resolution to measure the height and planting density of trees in forests. Based on C-band, nadir looking airborne radar data from a site in Southwest France, a single-scattering model is developed and verified to aid in the interpretation of such data.

Author

# A87-38097\* Purdue Univ., West Lafayette, Ind. VARIATIONS IN THE POLARIZED LEAF REFLECTANCE OF SORGHUM BICOLOR

LOIS GRANT, C. S. T. DAUGHTRY (Purdue University, West Lafayette, IN), and V. C. VANDERBILT (NASA, Ames Research Center, Moffett Field, CA; Purdue University, West Lafayette, IN) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, April 1987, p. 333-339. refs (Contract NAG5-269)

The polarized reflectance factor, Rq, of sorghum (Sorghum bicolor, L.) leaves from field-grown plants was measured in situ in the summers of 1983 and 1984. In 1983, three leaves of two randomly selected plants were measured at 2-week intervals. The value of Rq varied, depending on leaf and day of measurement. Measured values of Rq for the adaxial leaf surface ranged from 16 to 53; for the abaxial leaf surface the values ranged from 28 to 69. In 1984, measurements consisted of repeated observations made on the same leaf at biweekly intervals. The values of Rq from the adaxial leaf surface ranged from 26 to 38. Values of Rq from the abaxial leaf surface increased throughout the season, from 16 to 45. Differences in Rq were attributed to changes in surface details of the leaf.

#### A87-39185

### REMOTE SENSING OF VEGETATION CHANGE NEAR INCO'S SUDBURY MINING COMPLEXES

J. A. E. ALLUM (Inco, Ltd., Exploration Dept., Mississauga, Canada) and B. R. DREISINGER (Inco, Ltd., Safety and Environmental Control, Copper Cliff, Canada) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 399-416.

Using Landsat data for different years between 1973 and 1983, vegetation change maps were produced for two areas in the vicinity of Inco's mining complexes. Field checking showed that for more than 80 percent of the sites inspected, causes for the vegetation changes recorded on the maps could be determined. The system used provides a cost-effective method of monitoring major vegetation changes over a number of years, but it is not suitable for monitoring slow, progressive, vegetation changes over short periods.

A87-39187\* Canada Centre for Remote Sensing, Ottawa (Ontario).

# PROCEDURES FOR THE DESCRIPTION OF AGRICULTURAL CROPS AND SOILS IN OPTICAL AND MICROWAVE REMOTE SENSING STUDIES

J. CIHLAR (Canada Centre for Remote Sensing, Ottawa, Canada), M. C. DOBSON (Michigan, University, Ann Arbor), T. SCHMUGGE (NASA, Goddard Space Flight Center, Greenbelt, MD), P. HOOGEBOOM (Nederlandsche Centrale Organisatie voor Togepast Natuurwetenschappelijk Onderzoek, The Hague, Nethe, A. R. P. JANSE (Landbouwhogeschool, Wageningen, Netherlands) et al. International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 427-439. refs

This paper describes procedures for characterizing agricultural crops and soils in remote sensing studies. The procedures are based on the accumulated experience of a number of researchers active in this field. Therefore, they represent a compromise between the theoretically desirable and the practically feasible, and should thus be an effective aid in further studies of this type. Although the guidelines were prepared specifically for microwave studies, adjustments were made to render the procedures applicable to optical studies as well. Given the increasing number of research teams involved in remote sensing applied to agriculture, there is an opportunity to acquire a broad data base on soils and crops in various geographic regions. To allow intercomparisons of such data, they must be obtained in a consistent manner. By following the proposed procedures and reporting results using the parameters described here, such intercomparisons should be possible on a continental or a global scale.

**A87-39191\*** National Oceanic and Atmospheric Administration, Washington, D. C.

SATELLITE DETECTION OF TROPICAL BURNING IN BRAZIL MICHAEL MATSON (NOAA, National Environmental Satellite, Data, and Information Service, Washington, DC) and BRENT HOLBEN (NASA, Goddard Space Flight Center, MD) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 509-516. refs

Tropical burning often occurs in remote areas of the world. Satellite remote sensing is the only practical solution for detecting and monitoring this burning. The capability of the Advanced Very High Resolution Radiometer on board the National Oceanic and Atmospheric Administration polar orbiting satellites to detect tropical fire activity in the Manaus, Brazil area is demonstrated.

Author

**A87-39194\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

### MONITORING VEGETATION USING NIMBUS-7 SCANNING MUTICHANNEL MICROWAVE RADIOMETER'S DATA

B. J. CHOUDHURY, C. J. TUCKER (NASA, Goddard Space Flight Center, Greenbelt, MD), R. E. GOLUS (Science Applications Research, Lanham, MD), and W. W. NEWCOMB (RMS Technologies, Inc., Landover, MD) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 533-538. refs

Field studies and radiative transfer model calculations have shown that brightness temperature at high microwave frequencies is strongly affected by vegetation. The daytime observations for six consecutive years (1979 to 1984) over the Sahara, Senegalese Sahel, Burkina Fasso (Upper Volta), and U.S. Southern Great Plains at 37 GHz frequency of the Sanning Multichannel Microwave Radiometer (SMMR) on board the Nimbus-7 satellite are analyzed. and a high correlation with the normalized difference vegetation index derived from the Advanced Very High Resolution Radiometer on board the NOAA-7 satellite is found. The SMMR data appear to provide a valuable new long-term global data set for monitoring vegetation. In particular, the differing responses of vegetation (for example, annual grasses versus woody plants) to drought and the stability of the desert/steppe boundary of northern Africa might be studied using the time series data. Author

### **A87-40244\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

### CONCERNING THE RELATIONSHIP BETWEEN EVAPOTRANS-PIRATION AND SOIL MOISTURE

PETER J. WETZEL (NASA, Goddard Space Flight Center, Greenbelt, MD) and JY-TAI CHANG (SASC Technologies, Inc., Hyattsville, MD) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 26, Jan. 1987, p. 18-27. NASA-sponsored research. refs

The relationship between the evapotranspiration and soil moisture during the drying, supply-limited phase is studied. A second scaling parameter, based on the evapotranspirational supply and demand concept of Federer (1982), is defined; the parameter, referred to as the threshold evapotranspiration, occurs in vegetation-covered surfaces just before leaf stomata close and when surface tension restricts moisture release from bare soil pores. A simple model for evapotranspiration is proposed. The effects of natural soil heterogeneities on evapotranspiration computed from the model are investigated. It is observed that the natural variability in soil moisture, caused by the heterogeneities, alters the relationship between regional evapotranspiration and the area average soil moisture.

# A87-40248\* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. SOIL MOISTURE ESTIMATION USING GOES-VISSR INFRARED

SOIL MOISTURE ESTIMATION USING GOES-VISSR INFRARED DATA - A CASE STUDY WITH A SIMPLE STATISTICAL METHOD

PETER J. WETZEL (NASA, Goddard Space Flight Center, Greenbelt, MD) and ROBERT H. WOODWARD (General Software Corp., Landover, MD) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 26, Jan. 1987, p. 107-117. refs

Five days of clear sky observations of Kansas and Nebraska are used to examine the statistical relationship between soil moisture and infrared surface temperature observations taken from a geosynchronous satellite. Linear regression is used to relate soil moisture to surface temperature and other variables that represent wind speed, vegetation cover, and low-level temperature advection. Results show good agreement between estimated and observed soil moisture features on each of the 5 days. The average coefficient of determination for five pseudoindependent tests in which the test day is held out of the regression is 0.71. It is shown that a depletion coefficient of 0.92, when used to compute antecedent precipitation index (API), produces the best correlation between API and soil moisture as inferred from GOES thermal infrared data. By averaging daily predicted values over the 5-day rain-free case study period, 92 percent of the variance of the morning surface temperature change is explained by a simple

multiple linear regression with all independent variables, or, alternatively, 85 percent of the observed variance in API is explained. It is concluded that this approach can distinguish at least four classes of soil wetness, but the necessity for measurement of surface advection may limit its usefulness in remote areas.

A87-40301\* National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.

AIRBORNE REMOTE SENSING OF FOREST BIOMES

STEVEN A. SADER (NASA, National Space Technology Laboratories, Bay Saint Louis, MS) Geocarto International, vol. 2, March 1987, p. 9-17. refs

Airborne sensor data of forest biomes obtained using an SAR. a laser profiler, an IR MSS, and a TM simulator are presented and examined. The SAR was utilized to investigate forest canopy structures in Mississippi and Costa Rica; the IR MSS measured forest canopy temperatures in Oregon and Puerto Rico; the TM simulator was employed in a tropical forest in Puerto Rico; and the laser profiler studied forest canopy characteristics in Costa Rica. The advantages and disadvantages of airborne systems are discussed. It is noted that the airborne sensors provide measurements applicable to forest monitoring programs.

### MONTANE VEGETATION STRATIFICATION THROUGH DIGITAL PROCESSING OF LANDSAT MSS DATA

PARTH SARATHI ROY (Indian Institute of Remote Sensing, Dehra Dun, India) Geocarto International, vol. 2, March 1987, p. 19-26.

Vegetation stratification in mountainous terrain using space remote sensing techniques is complicated due to varying illumination condition and altitudinal control of vegetation. The present study deals with digital techniques to stratify vegetation in a test area of Arunachal Pradesh (India) using Landsat multispectral data. Various band ratio combinations have been tried to reduce effect of varying illumination and to enhance subtle variation in broad vegetation types. Normalized vegetation index has been found to enhance maximum features. Hence, an attempt was made to improve classification accuracy and identify certain vegetation classes using supervised classification of transformed Landsat multispectral data with normalized difference index, otherwise not possible using normal Landsat MSS data.

### A87-40303\* Maryland Univ., College Park.

COMPARISON OF NORTH AND SOUTH AMERICAN BIOMES FROM AVHRR OBSERVATIONS

SAMUEL N. GOWARD, DENNIS DYE (Maryland, University, College Park), ARLENE KERBER, and VIRGINIA KALB (NASA, Goddard Space Flight Center, Greenbelt, MD) Geocarto International, vol. 2, March 1987, p. 27-39. NASA-supported research. refs (Contract NCC5-26)

Previous analysis of the North American continent with AVHRR-derived vegetation index measurements showed a strong relation between known patterns of vegetation seasonality. productivity and the spectral vegetation index measurements. This study extends that analysis to South America to evaluate the degree to which these findings extend to tropical regions. The results show that the spectral vegetation index measurements provide a general indicator of vegetation activity across the major biomes of the Western Hemisphere of the earth, including tropical regions. The satellite-observed patterns are strongly related to the known climatology of the continents and may offer a means to improve understanding of global bioclimatology. For example, South America is shown to have a longer growing season with much earlier spring green-up than North America. The time integral of the measurements, computed from 12 composited monthly values, produces a value that is related to published net primary productivity data. However, limited net primary production data does not allow complete evaluation of satellite-observed contrasts between North and South American biomes. These results suggest that satellite-derived spectral vegetation index measurements are of great potential value in improving knowledge of the earth's

#### A87-40304

### THE USE OF AVHRR DATA IN OPERATIONAL AGRICULTURAL ASSESSMENT IN AFRICA

GARY E. JOHNSON, CLARENCE M. SAKAMOTO (NOAA, Climatic Impact Assessment Div., Columbia, MO), and ALBERT VAN DIJK (Cooperative Institute for Applied Meteorology, Columbia, MO) Geocarto International, vol. 2, March 1987, p. 41-60. Research supported by the Agency for International Development and NOAA. refs

### A87-40944\* Scranton Univ., Pa.

### REMOTE SENSING OF COASTAL WETLANDS

M. A. HARDISKY (Scranton, University, PA), V. KLEMAS (Delaware, University, Newark), and M. F. GROSS BioScience (ISSN 0006-3568), vol. 36, July-Aug. 1986, p. 453-460. Research supported by the Tinker Foundation and University of Delaware.

(Contract NOAA-NA-85AADSG033; NAGW-374; NSF DAR-80-17836)

Various aircraft and satellite sensors for detecting and mapping wetlands properties are examined. The uses of color IR photography to map coastal vegetation, and of Landsat MSS and TM and SPOT data to quantify biomass and productivity for large wetland areas are discussed. For spectral estimation of biomass and productivity, the relation between radiance and biomass needs to be studied; the quantity and orientation of dead biomass and the amount of soil reflectance in comparison with vegetation reflectance in a given target area affect the spectral estimation of biomass. The radiometric evaluation of brackish wetland, and remote sensing in mangroves are described. The collection of images in narrow, contiguous spectral band using imaging spectrometry is considered.

#### A87-41428

### A SOIL MAP THROUGH LANDSAT SATELLITE IMAGERY IN A PART OF THE AURANGA CATCHMENT IN THE RANCHI AND PALAMOU DISTRICTS OF BIHAR, INDIA

R. R. BISWAS (All India Soil and Land Use Survey Organization, Dept. of Agriculture and Cooperation, Calcutta, In International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, April 1987, p. 541-543. refs

### A87-41430

### A POLAR PLATFORM FOR THE REMOTE SENSING NEEDS OF ECOLOGY AND AGRICULTURE - A VIEW FROM THE U.K.

P. J. CURRAN and S. E. PLUMMER (Sheffield, University, England) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, April 1987, p. 555-567. refs (Contract NERC-P60/G6/16)

The main characteristics of the proposed polar-orbiting remote sensing satellites to be implemented in the Space Station program are described. The potential benefits of the polar platforms to remote sensing are discussed. The remote sensing needs of UK scientists in the areas of ecology and agriculture are examined.

### RICE CROP IDENTIFICATION AND AREA ESTIMATION USING REMOTELY-SENSED DATA FROM INDIAN CROPPING

P. P. NAGESWARA RAO and V. R. RAO (Indian Space Research Organization, National Natural Resources Management System Office, Bangalore, International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, April 1987, p. 639-650. refs

A87-41771

PHASE PORTRAITS OF VEGETATION DEVELOPMENT TRAJECTORIES IN A MULTIDIMENSIONAL SPECTRAL ATTRIBUTE SPACE [FAZOVYE PORTRETY TRAEKTORII RASTITEL'NOSTI **MNOGOMERNOM** SPEKTRAL'NOM PRIZNAKOVOM PROSTRANSTVE

L. N. VASIL'EV (AN SSSR, Institut Geografii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 293, no. 3, 1987, p. 705, 706. In Russian.

In view of the sensitivity of the spectral brightness characteristics of vegetation and soil to meteorological conditions and changes in the terrain components, the objective of the experiment reported here was to evaluate changes in these characteristics for the totality of agricultural crops rather than for each crop individually. The experiment was carried out in 1979-1983 using space imagery obtained by the Salyut station and aerial photography. The phase trajectories obtained in a multidimensional spectral attribute space have vielded a characteristic of the seasonal crop development within a homogeneous agricultural area which can be used to monitor the state of crops in such an area on the basis of satellite and aerial data.

N87-20619 Delaware Univ., Newark.
REAL-TIME CROP ASSESSMENT USING COLOR THEORY AND SATELLITE DATA Ph.D. Thesis

RUSSELL ANDREW AMBROZIAK 1986 219 p Avail: Univ. Microfilms Order No. DA8629273

A new color coordinate system for satellite image display is developed and applied to crop monitoring using AVHRR data over the African Sahel. The system, called the Ambroziak Color Coordinate System (ACCS), is the result of applying color theory, models of human vision, and analyses of the unique constraints put on remote sensing for agriculture by the interaction of the vegetation's and atmosphere's time scales of change. The new color system allows real-time quantitative analysis of crops to be done in support of regional and national food security programs. The need for such a system is demonstrated by the severe food shortages in parts of Africa over the past several years and the delayed reports of existing problems. Based on the analysis of the strengths and weaknesses of false color IR images in existing crop monitoring systems which use remotely sensed data, the steps necessary to improve the usefulness of the image without sacrificing its strengths are outlined. The result is the development of the ACCS. The ACCS is then used to produce high resolution, effective cumulative rainfall analyses of the African Sahel and Horn regions. Dissert, Abstr.

N87-21408# National Aerospace Lab., Amsterdam (Netherlands). Space Div

FOUNDATIONS AND APPLICATIONS OF MULTISPECTRAL SCANNING IN AGRICULTURE

N. J. BUNNIK 5 Feb. 1985 46 p In DUTCH; ENGLISH summary Presented at the Royal Society for Physics Diligentia, The Netherlands, 5 Nov. 1985

(NLR-MP-85015-U; ETN-87-99283) Avail: NTIS HC A03/MF A01 Remote sensing techniques in the visible and near IR ranges for crop yield forecasting and crop disease identification are treated. The interaction of crops and soils with short wave radiation in the optical spectrum is discussed in order to derive the necessary information regarding the spectral distribution of reflected sunlight. The modeling of vegetation canopies is described in relation to yield measurement techniques. The operating principles of multispectral scanning are given, together with examples.

N87-22280 Missouri Univ., Columbia.

A CROP CONDITION AND CROP YIELD ESTIMATION METHOD BASED ON NOAA/AVHRR SATELLITE DATA Ph.D. Thesis ALBERT VANDIJK 1986 215 p

Avail: Univ. Microfilms Order No. DA8701412

The objective was to develop a crop condition and yield assessment method based on NOAA/Advanced Very High Resolution Radiometer (AVHRR) satellite data for the Sahel and Horn countries of Africa. The method consists of the following steps. (1) Noise in the NOAA/AVHRR satellite data can cause misinterpretation. A proposed procedure reduces the noise by calculating a vegetation index from satellite data that is a measure of the green biomass. The index is then sampled and averaged in time and space and smoothed by applying an algorithm. (2) NOAA satellite data covering large areas are available every week. A system has been developed to pinpoint areas with abnormal vegetation conditions. (3) The yield estimation method is based on the following dea. In Africa a low percentage of the potential agricultural land is used. During grain-filling of a crop, when the green biomass decreases, the vegetation index of the crop decreases. However, the crop's contribution to the vegetation index of the entire area will be small. As a result, the following rule applies: a high vegetation index during the grain filling stage of a crop indicates a large amount of biomass, favorable growing conditions during that critical period, and a large yield. Regression analysis was performed to establish relationships between yields of millet, sorghum, and groundnuts and the vegeta values during the reproductive phase of these crops.

N87-22296\*# Michigan Univ., Ann Arbor. School of Natural Resources

**EVALUATION OF THE AIRBORNE IMAGING SPECTROMETER** FOR REMOTE SENSING OF FOREST STAND CONDITIONS Final **Technical Report** 

CHARLES E. OLSON, JR. May 1986 86 p (Contract JPL-956578)

(NASA-CR-180918; JPL-9950-1281; NAS 1.26:180918) Avail: NTIS HC A05/MF A01 CSCL 14B

Five pairs of plots were established in forest stands with one of each pair trenched and covered to prevent precipitation from reaching the tree roots. High winds and falling limbs destroyed the covers on three of the plots. The two remaining plots were in a red pine plantation and in a natural stand of sugar maple. Trees in both plots developed levels of moisture stress more than nine bars higher than control trees on the dates of overflights with the Airborne Imaging Spectrometer (AIS) and the Collins' Airborne Spectroradiometer (CAS). Hemispherical reflectance from stressed and control trees was measured with a Beckman DK2A spectrophotometer. On the day of the AIS overflight, stressed maple foliage was less reflective than the control from 1000 to 1300 nm, but more reflective at wavelengths longer than 1300 nm. Pine foliage was less reflective than the control from 1000 to 1600 nm, but the difference was small at wavelengths longer than 1350 nm. AIS data collected showed brightness values for both maple and pine to be lower than for the controls from 1000 to 1300 nm. CAS data were used to determine the gain in species identification accuracy obtainable with high spectral resolution

N87-22336# Missouri Univ., Columbia. Cooperative Inst. for Applied Meteorology.

A REVIEW OF NATIONAL AND INTERNATIONAL ACTIVITIES ON MODELING THE EFFECTS OF INCREASED CO2 CONCENTRATIONS ON THE SIMULATION OF REGIONAL CROP PRODUCTION: A REPORT ON LINKAGE BETWEEN **CLIMATE AND CROP MODELS Progress Report** 

W. L. DECKER and R. ACHUTUNI 1 Jan. 1987 47 p (Contract DE-FG02-86ER-60444) (DE87-005994; DOE/ER-60444/T1) Avail: NTIS HC A03/MF

General circulation models have been used to estimate the probable changes in climate due to increased levels of carbon dioxide. These models, generally, paject increases in the mean surface temperatures; but changes in precipitation due to CO2 enrichment are not as clear. Some process models, which utilize a minimum amount of empiricism, can be adopted for use in studying the impacts of both climate change scenarios and the direct effects of CO2 fertilization. The CERES-Maize, CERES-Wheat, SORGF, GLYCIM, and SOYGRO are among those classified for this use. A great deal of effort is directed toward these developments. WMO/UNEP/ICSU has sponsored at least

two European meetings but with only limited success for testing production models. A similar effort has been conducted by the Commission of European Communities. An attempt has been made to modify the CERES models, which have been used in climate studies, for use in simulation of the direct effects. Initial simulations involving this modification, show that doubling CO2 will increase corn production 12 to 30% at locations in northern Illinois for the four-year period 1982 to 1985. Photosynthesis influenced yields more than decreased transpiration.

N87-23032# Missouri Univ., Columbia. Dept. of Atmospheric **Sciences** 

THE IMPACT OF CLIMATE CHANGE FROM INCREASED **ATMOSPHERIC** CARBON DIOXIDE ON **AGRICULTURE** 

WAYNE L. DECKER, VERNON K. JONES, and RAO ACHUTUNI May 1986 108 p (Contract W-7405-ENG-48)

(DOE/NBB-0077) Avail: NTIS HC A06/MF A01

The impact of climate change on crop production and animal production are discussed. Genetic selection, cropping patterns, farm management techniques, pest management, forage production and water availability are among the topics considered.

National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex. ERROR ANALYSIS OF LEAF AREA ESTIMATES MADE FROM

ALLOMETRIC REGRESSION MODELS A. H. FEIVESON and R. S. CHHIKARA 14 Jul. 1986 44 p (Contract NAG5-548)

(NASA-TM-89220; NAS 1.15:89220) Avail: NTIS HC A03/MF

A01 CSCL 02F

Biological net productivity, measured in terms of the change in biomass with time, affects global productivity and the quality of life through biochemical and hydrological cycles and by its effect on the overall energy balance. Estimating leaf area for large ecosystems is one of the more important means of monitoring this productivity. For a particular forest plot, the leaf area is often estimated by a two-stage process. In the first stage, known as dimension analysis, a small number of trees are felled so that their areas can be measured as accurately as possible. These leaf areas are then related to non-destructive, easily-measured features such as bole diameter and tree height, by using a regression model. In the second stage, the non-destructive features are measured for all or for a sample of trees in the plots and then used as input into the regression model to estimate the total leaf area. Because both stages of the estimation process are subject to error, it is difficult to evaluate the accuracy of the final plot leaf area estimates. This paper illustrates how a complete error analysis can be made, using an example from a study made on aspen trees in northern Minnesota. The study was a joint effort by NASA and the University of California at Santa Barbara known as COVER (Characterization of Vegetation with Remote Sensing).

N87-24593# Sandia National Labs., Albuquerque, N. Mex.

MEASURED RADAR RETURN AT THE NEAR VERTICAL FROM FORESTED TERRAINS

D. A. JELINEK May 1987 57 p (Contract DE-AC04-76DP-00789)

(DE87-009384; SAND-86-2618) Avail: NTIS HC A04/MF A01

This report presents the results of measurements that were made of the radar return from forested terrains. Measurements were taken while making straight and level passes with a helicopter over nearly pure stands of dense conifer and deciduous forests which were located on very flat terrain. The measurements were made using a 20-nanosecond pulse width, x-band radar and 16-degree-beamwidth antennas pointed straight down. Results are presented in terms of the average return power density at the receiving antenna as a function of round-trip delay for each forest for altitudes above the forest floor ranging from 100 to 1000 feet.

N87-24733\*# California Univ., Santa Barbara. Dept. of **Environmental Studies** 

**EARTH SCIENCE RESEARCH Final Report** 

DANIEL B. BOTKIN 4 May 1987 9 p

(Contract NAG5-548)

(NASA-CR-180512; NAS 1,26:180512) Avail: NTIS HC A02/MF A01 CSCL 05B

The analysis of ground-truth data from the boreal forest plots in the Superior National Forest, Minnesota, was completed. Development of statistical methods was completed for dimension analysis (equations to estimate the biomass of trees from measurements of diameter and height). The dimension-analysis equations were applied to the data obtained from ground-truth plots, to estimate the biomass. Classification and analyses of remote sensing images of the Superior National Forest were done as a test of the technique to determine forest biomass and ecological state by remote sensing. Data was archived on diskette and tape and transferred to UCSB to be used in subsequent research.

N87-24735\*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

NEW DIMENSION ANALYSES WITH ERROR ANALYSIS FOR QUAKING ASPEN AND BLACK SPRUCE

K. D. WOODS, D. B. BOTKIN, and A. H. FEIVESON 1987 66

(NASA-TM-89219; NAS 1.15:89219) Avail: NTIS HC A01/MF

A01 CSCL 02F

Dimension analysis for black spruce in wetland stands and trembling aspen are reported, including new approaches in error analysis. Biomass estimates for sacrificed trees have standard errors of 1 to 3%; standard errors for leaf areas are 10 to 20%. Bole biomass estimation accounts for most of the error for biomass, while estimation of branch characteristics and area/weight ratios accounts for the leaf area error. Error analysis provides insight for cost effective design of future analyses. Predictive equations for biomass and leaf area, with empirically derived estimators of prediction error, are given. Systematic prediction errors for small aspen trees and for leaf area of spruce from different site-types suggest a need for different predictive models within species. Predictive equations are compared with published equations; significant differences may be due to species responses to regional or site differences. Proportional contributions of component biomass in aspen change in ways related to tree size and stand development. Spruce maintains comparatively constant proportions with size, but shows changes corresponding to site. This suggests greater morphological plasticity of aspen and significance for spruce of nutrient conditions.

N87-24736\*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TEN YEAR CHANGE IN FOREST SUCCESSION AND COMPOSITION MEASURED BY REMOTE SENSING

FORREST G. HALL, DANIEL B. BOTKIN, DONALD E. STREBEL, KERRY K. WOODS, and SCOTT J. GOETZ (Science Applications, inc., Greenbeit, Md.) 15 Apr. 1987 22 p (Contract NAG5-548)

(NASA-CR-180948; NAS 1.26:180948) Avail: NTIS HC A02/MF A01 CSCL 02F

Vegetation dynamics and changes in ecological patterns were measured by remote sensing over a 10 year period (1973 to 1983) for 148,406 landscape elements, covering more than 500 sq km in a protected forested wilderness. Quantitative measurements were made possible by methods to detect ecologically meaningful landscape units; these allowed measurement of ecological transition frequencies and calculation of expected recurrence times. Measured ecological transition frequencies reveal boreal forest wilderness as spatially heterogeneous and highly dynamic, with one-sixth of the area in clearings and early successional stages, consistent with recent postulates about the spatial and temporal patterns of natural ecosystems. Differences between managed forest areas and a protected wilderness allow assessment of different management regimes.

N87-24737\*# Aster Consulting Associates, Inc., La Jolla, Calif. INVERSION OF CANOPY REFLECTANCE MODELS FOR ESTIMATION OF VEGETATION PARAMETERS Final Report NARENDRA S. GOEL 15 Jun. 1987 20 p (Contract NAS5-29472)

(NASA-CR-181059; NAS 1.26:181059) Avail: NTIS HC A02/MF A01 CSCL 02F

One of the keys to successful remote sensing of vegetation is to be able to estimate important agronomic parameters like leaf area index (LAI) and biomass (BM) from the bidirectional canopy reflectance (CR) data obtained by a space-shuttle or satellite borne sensor. One approach for such an estimation is through inversion of CR models which relate these parameters to CR. The feasibility of this approach was shown. The overall objective of the research carried out was to address heretofore uninvestigated but important fundamental issues, develop the inversion technique further, and delineate its strengths and limitations.

N87-24801# Wageningen Agricultural Univ. (Netherlands).
DETERMINATION OF SPECTRAL REFLECTANCE OF CROPS
DURING GROWTH FROM CALIBRATED MULTISPECTRAL
SMALL FORMAT AERIAL PHOTOGRAPHY

J. H. LOEDEMAN, J. G. P. W. CLEVERS, and C. A. HORTON (Polytechnic, London, England) In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 519-531 Nov. 1986

Avail: NTIS HC A99/MF A01

Spectral reflectance factors of crops in field trials were calculated from radiometrically calibrated multispectral aerial photography. The objectives required matching defined spectral bands; film processing under sensitometric control; radiometric correction for effects due to atmosphere and camera; and synthesis of densitometry and photogrammetry. Under meteorological conditions in the Netherlands nearly instant availability of a recording system is needed. Recordings were executed with standard 70 mm cameras, films, and gelatin filters. Densitometry was done using a Macbeth TD-504 modified to a scanning densitometer, interfaced with an HP-85 computer. Results are comparable with those of ground based radiometry.

### 02

### ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metroplitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

A87-32196\*# Virginia Univ., Charlottesville.

### TRACE GAS EXCHANGES AND TRANSPORTS OVER THE AMAZONIAN RAIN FOREST

MICHAEL GARSTANG, STEVE GRECO, JOHN SCALA (Virginia, University, Charlottesville), ROBERT HARRISS, EDWARD BROWELL, GLENN SACHSE (NASA, Langley Research Center, Hampton, VA), JOANNE SIMPSON, WEI-KUO TAO (NASA, Goddard Space Flight Center, Greenbelt, MD), and ARNOLD TORRES (NASA, Wallops Flight Center, Wallops Island, VA) AMS, International Conference on Southern Hemisphere Meteorology, Wellington, New Zealand, Dec. 1-5, 1986, Paper. 5 p. refs (Contract NCCI-95)

Early results are presented from a program to model deep convective transport of chemical species by means of in situ data collection and numerical models. Data were acquired during the NASA GTE Amazon Boundary Layer Experiment in July-August 1985. Airborne instrumentation, including a UV-DIAL system, collected data on the O3, CO, NO, temperature and water vapor profiles from the surface to 400 mb altitude, while GOES imagery tracked convective clouds over the study area. A two-dimensional cloud model with small amplitude random temperature fluctuations

at low levels, which simulated thermals, was used to describe the movements of the chemical species sensed in the convective atmosphere. The data was useful for evaluating the accuracy of the cloud model, which in turn was effective in describing the circulation of the chemical species.

M.S.K.

#### A87-32493

ESTIMATION OF ROUGHNESS OF THE EARTH'S SURFACE USING LANDSAT MSS DATA ON THE ASSUMPTION OF RECIPROCITY ON LIGHT SCATTERING

HIROSHI OKAYAMA (Chiba University, Japan) and IWAO OGURA (Tokyo, University, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1607-1611. refs

Using ground-glass samples of various degree of roughness to simulate the roughness of the earth's surface, the indicatrices which represent the angular distribution of the scattered light were obtained, and Minnaert's (1941) constants of the respective samples were determined. After it was verified that the scattered light from a sphere fulfills the reciprocity law, the indicatrices of a coastal area and of several Tokyo districts (representing a residential, a mixed residence and business, and a downtown area were obtained using Landsat MSS data. It was shown that the Minnaert constant of the downtown area (1.60) is substantially greater than that of the coastal area (0.923), with the value of the mixed residential-business area next highest. The Minnaert constant value for the downtown area was approximately the same as that for the ground glass with a mesh number 3000.

#### 87-32494

### LANDCOVER CHANGE IN HIROSHIMA DURING 1979/1984 DETECTED BY LANDSAT MSS AND TM DATA

KAZUAKI KAMEDA, SHUUHEI UMEZONO (Nihon University, Tokyo, Japan), YUZO SUGA (Hiroshima Institute of Technology, Japan), SOTARO TANAKA, and TOSHIRO SUGIMURA (Remote Sensing Technology Center of Japan, Tokyo) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2 . Tokyo, AGNE Publishing, Inc., 1986, p. 1613-1618.

### A87-32496

FUNDAMENTAL STUDY ON SYSTEMATIZATION OF SELECTING NEW DEVELOPMENT AREA WITH LANDSAT DATA AND TOPOGRAPHIC INFORMATIONS

TAICHI OSHIMA and KIYOE MIYASHITA (Hosei University, Koganei, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1631-1636.

Criteria of land selection on the basis of remote-sensing data are developed in connection with the concept planning stage of a land utilization program. The overlay processing of multidimensional information is used to select appropriate lands on the basis of a combination of Landsat data and topographical information. Results corresponding to regions near Hachioji and Musashi Fuchu are discussed.

### A87-32953

POLARIZATION, LAND USE TYPE AND INTRAURBAN LOCATION AS VARIABLES IN SAR MAPPING ACCURACY

FLOYD M. HENDERSON (New York, State University, Albany) Geocarto International, no. 4, 1986, p. 27-37. refs (Contract NSF SES-81-12797)

Dual-polarized X-band airborne synthetic aperture radar imagery of Los Angeles, CA is employed to examine the relationship among urban land use category identification, category location within an urban area, and radar polarization. Results indicate that HV polarized imagery may be preferred for urban land use mapping as the signal response is less sensitive to target orientation and surface scatter. That is, there was more category related variation in tone and texture. For both polarizations there were significant differences in identification accuracy among land use classes and

the ability to identify a single land use type varied across the study area, but not equally. A major problem relative to developing applications was the inability to distinguish Commercial-Services and Industrial activity from other categories.

Author

#### A87-33292

### LIDAR OBSERVATION OF ELEVATED POLLUTION LAYERS OVER LOS ANGELES

ROGER M. WAKIMOTO (California, University, Los Angeles) and JAMES L. MCELROY (EPA, Environmental Monitoring Systems Laboratory, Las Vegas, NV) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 25, Nov. 1986, p. 1583-1599. Research sponsored by the California Air Resources Board, South Coast Air Quality Management District, and EPA. refs

Elevated pollution layers are observed over Los Angeles with an aircraft equipped with a downward-looking lidar. For the first time, detailed ancillary upper-air kinematic and thermodynamic data were collected simultaneously to aid in the interpretation of these elevated layers. It is concluded that upper-level winds within the inversion, orographic effects, and thermally induced changes in the depth of the mixed layer control the evolution of these layers. Author

#### A87-35523

### COMPARISON OF LANDSAT MSS AND TM DATA FOR URBAN LAND-USE CLASSIFICATION

SIAMAK KHORRAM, JOHN A. BROCKHAUS, and HEATHER M. CHESHIRE (North Carolina State University, Raleigh) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 238-243. Research supported by North Carolina State University.

A supervised classification of digital Landsat Multispectral Scanner (MSS) data for the Raleigh, NC, metropolitan area was conducted in 1982. These data were categorized into 10 land-use/land-cover representative of the area. Digital Landsat Thematic Mapper (TM) data, for the Raleigh metropolitan area, were obtained in 1985 and analyzed for comparison to the MSS data. A stratified classification based upon principal components analysis was applied to the TM data, classifying the data into the 10 land-use/land-cover categories used in the analysis of the MSS data. Comparison of photo-interpreted land-use types and Landsat derived land-use types indicates that TM data provides significantly higher classification accuracies than can be obtained from MSS data. However, an increase in confusion between urban cover types was observed for the classified TM data over the MSS data. It is felt that the stratified classification approach was instrumental in reducing classification errors between general land-use/land-cover types such as urban areas, coniferous forests. and deciduous forests. It is not clear that the information extracted from the TM data regarding the urban environment will be of much more use to city planners than that obtained from MSS data. Author

### A87-36125

THE POSSIBILITY OF USING SATELLITE MEASUREMENTS OF METHANE IN THE ATMOSPHERE TO STUDY THE GLOBAL-DISTRIBUTION CHARACTERISTICS OF ITS SOURCES [O VOZMOZHNOSTI ISPOL'ZOVANIIA SPUTNIKOVYKH IZMERENII METANA V ATMOSFERE DLIA IZUCHENIIA OSOBENNOSTEI GLOBAL'NOGO RASPREDELENIIA EGO ISTOCHNIKOV]

F. M. GADZHIR-ZADE, I. S. GULIEV, and A. A. FEIZULLAEV (AN ASSR, Nauchno-Proizvodstvennoe Ob'edinenie Kosmicheskikh Issledovanii, Azerbaidzhan SSR) Akademiia Nauk Azerbaidzhanskoi SSR, Doklady (ISSN 0002-3078), vol. 42, no. 6, 1986, p. 47-50. In Russian. refs

### A87-36363

### **ENVIRONMENTAL PROTECTION FROM SPACE**

IULIAN NOVIKOV (AN SSSR, Moscow, USSR) Space (ISSN 0267-954X), vol. 3, Mar.-Apr. 1987, p. 36, 37.

The use of remote sensing satellites for monitoring pollution is discussed. The visible, near-IR, and IR regions of the spectrum

are utilized to study pollution and its effect on the environment. The processing of the satellite data by adding false color to zones differing in density and structure is described. The data are applicable for geologists, land surveyors, foresters, oil workers, and environmental protection specialists.

#### A87-37277

# TESTING THE CONSISTENCY FOR MAPPING URBAN VEGETATION WITH HIGH-ALTITUDE AERIAL PHOTOGRAPHS AND LANDSAT MSS DATA

FRANK G. SADOWSKI (TGS Technology, EROS Data Center, Sioux Falls, SD), JAMES A. STURDEVANT (USGS, EROS Data Center, Sioux Falls, SD), and ROWAN A. ROWNTREE (USDA, Northeastern Forest Experiment Station, Syracuse, NY) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, March 1987, p. 129-141. refs

Two methods of analysis were evaluated for mapping urban vegetation on high-altitude, color-infrared aerial photographs and Landsat MSS data of Syracuse, NY. The first method consisted of defining the spatial patterns (strata) of urban vegetation occurrence. The second method discriminated woody and herbaceous vegetation classes within defined strata. Emphasis was placed on evaluating the consistency of each method. Results indicate that consistent spatial patterns of urban vegetation strata were not achieved on either of the two data types tested due to the spatial complexity of the urban vegetation. However, for discriminating woody and herbaceous vegetation classes within defined strata, good consistency was noted among the interpreters of the high-altitude aerial photographs. The coarse spatial resolution of the Landsat MSS data resulted in low precision for identifying these two vegetation classes in this highly urbanized area. Where photointerpretation efforts are intended for mapping vegetation within numerous urban areas, the estimation of proportions of vegetation classes within defined strata should be a data analysis procedure more objective and consistently repeatable than is the delineation of vegetation patterns. Author

### A87-37280\* George Mason Univ., Fairfax, Va.

# AN ASSESSMENT OF LANDSAT MSS AND TM DATA FOR URBAN AND NEAR-URBAN LAND-COVER DIGITAL CLASSIFICATION

BARRY HAACK (George Mason University, Fairfax, VA), NEVIN BRYANT, and STEVEN ADAMS (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, March 1987, p. 201-213. refs

(Contract NAS7-918)

The information content of Landsat TM and MSS data was examined to assess the ability to digitally differentiate urban and near-urban land covers around Miami, FL. This examination included comparisons of unsupervised signature extractions for various cover types, training site statistics for intraclass and interclass separability, and band and band combination selection from an 11-band multisensor data set. The principal analytical tool used in this study was transformed divergence calculations. The TM digital data are typically more useful than the MSS data in the homogeneous near-urban land-covers and less useful in the heterogeneous urban areas.

A87-39182\* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York, N.Y.

### DERIVING SURFACE ALBEDO MEASUREMENTS FROM NARROW BAND SATELLITE DATA

CHRISTOPHER L. BREST (NASA, Goddard Institute for Space Studies, New York) and SAMUEL N. GOWARD (Maryland, University, College Park) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 351-367. refs (Contract NCC5-20)

A target calibration procedure for obtaining surface albedo from satellite data is presented. The methodology addresses two key issues, the calibration of remotely-sensed, discrete wavelength, digital data and the derivation of an albedo measurement (defined over the solar short wave spectrum) from spectrally limited

observations. Twenty-seven Landsat observations, calibrated with urban targets (building roof-tops and parking lots), are used to derive spatial and seasonal patterns of surface reflectance and albedo for four land cover types: city, suburb, farm and forest.

Author

#### A87-39188

### URBAN LAND USE SEPARABILITY AS A FUNCTION OF RADAR POLARIZATION

FLOYD M. HENDERSON and KELLY A. MOGILSKI (New York, State University, Albany) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 441-448. refs

In this study the relationship between urban land use features and radar polarization was examined. Statistical tests were applied to density readings of HH- and HV-polarized X-band SAR imagery to determine: (1) differences in signal return among urban land use categories within a single polarization and (2) variations in signal return between polarizations for individual land use categories. Only one category produced a statistical difference between polarizations. Although some categories were separable on both polarizations, others were separable only on a single polarization. Possible reasons are discussed along with an observed clustering of classes by signal response/grey tone.

### A87-39593#

### STRATEGIES AND TECHNOLOGIES FOR MONITORING THE ENVIRONMENT

DIETER LEICHT Dornier Post (English Edition) (ISSN 0012-5563), no. 1, 1987, p. 34-36.

Various methods of environmental monitoring are discussed. Some applications for and the different types of sensors utilized in space and airborne environmental monitoring are described. Satellite-borne remote sensing is useful for detecting pollutants in the atmosphere and on the earth's surface and for monitoring meteorological parameters; the sensors used in satellite remote sensing operate in the visible, IR, and microwave ranges. Aircraft-based monitoring employs various sensor packages, which include SLAR, microwave radiometer, IR/UV scanner, laser fluorosensor, and cameras, to detect ocean pollution. Consideration is given to ground-based equipment used in the monitoring of air and water quality and nuclear power plants.

#### A87-42255

# USE OF MAPS, AERIAL PHOTOGRAPHS, AND OTHER REMOTE SENSOR DATA FOR PRACTICAL EVALUATIONS OF HAZARDOUS WASTE SITES

JOHN GRIMSON LYON (Ohio State University, Columbus) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, May 1987, p. 515-519. Research sponsored by the Ohio State University. refs

(Contract NOAA-04/M01-B4; NOAA-NA-81AAD0095)

Aerial photographs and remote sensor data were used to identify and inventory hydrologic, soil, and vegetative conditions indicative of hazardous waste sites. Several papers and their results demonstrate the utility of these data and techniques for engineering applications. A combination of aerial photos, remote sensing, maps, and advanced evaluation techniques provided more information than traditional engineering techniques alone.

Author

N87-23015# Louisiana State Univ., Baton Rouge. Remote Sensing and Image Processing Lab.

THE INTEGRATION OF SPECTRAL AND SPATIAL ANALYSIS FOR LAND USE CLASSIFICATION Final Report, 27 Sep. 1982 - 30 Sep. 1986

CHARLES A. HARLOW Dec. 1986 24 p (Contract DAAG29-82-K-0189)

(AD-A178703; ARO-19327.9-GS) Avail: NTIS HC A02/MF A01 CSCL 17H

This report describes the research conducted through September 1986 on the investigation of vision systems for aerial scenes. The projects reported on include: (1) Defining Measures Related to Perceptual Properties. (2) Texture Operators and their Application to Vision Systems, (3) Structure of Vision Systems for Aerial Scenes, and (4) General Purpose Spatial Operators. GRA

N87-24747# IBM France S. A., Paris. Science Center.

# TOWARDS AN AUTOMATIC IDENTIFICATION OF URBAN TEXTURES [VERS UNE IDENTIFICATION AUTOMATIQUE DES TISSUS URBAINS]

M. ARMAND and M. HERNANDEZ In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 73-85 Nov. 1986 In FRENCH; ENGLISH summary Original document contains color illustrations

Avail: NTIS HC A99/MF A01

Use of LANDSAT-5 Thematic Mapper imagery in urban planning and management was investigated. Urban structures and textures were analyzed, and the methodology of the photointerpreter was simulated. The radiometric properties were used for two types of Bayesian classifications: a general classification to identify the large homogeneous entities of the image, and a classification of primitives (urban, vegetation, streets). A moving window was applied to determine the percentage for each primitive contained in the corresponding homogeneous entity. Results were compared with existing urban cartography. The semiautomatic classification method works well, even if the division into zones is rather rough.

### 03

### **GEODESY AND CARTOGRAPHY**

Includes mapping and topography.

#### A87-31591

### A NEW COVARIANCE MODEL FOR INERTIAL GRAVIMETRY AND GRADIOMETRY

RENE FORSBERG (Geodetic Institute, Charlottenlund, Denmark) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 10, 1987, p. 1305-1310. refs (Contract NATO-320/82)

A self-consistent covariance model for the earth's anomalous gravity field is presented within the framework of the planar approximation. The model features simple, closed formulas for autocovariances and cross covariances of geoid undulations, gravity anomalies, deflections of the vertical, and second-order gradients, both at the reference plane and aloft. Furthermore the main spectral decay of the model gravity power spectral density corresponds closely to Kaula's (1966) rule, thus yielding good fits to actual gravity field spectral characteristics. The outlined model may be viewed as the planar equivalent to the spherical Tscherning-Rapp (1974) model. The analytical model is characterized by three free parameters: the gravity anomaly variance a 'shallow' depth parameter, and a 'compensating' depth. These parameters act as scale factor, high-frequency attenuation. and low-frequency attenuation, respectively. The shallow depth parameter corresponds to twice the Bjerhammer sphere depth of spherical harmonic analysis, while the compensating depth is introduced as an arbitrary mathematical convenience, necessary to obtain finite values for gravity and geoid variance.

### A87-33375

### INVESTIGATION OF TECTONIC DEFORMATIONS USING GLOBAL SATELLITE LASER RANGING DATA

R. DIETRICH and G. GENDT (Akademie der Wissenschaften der DDR, Zentralinstitut fuer Physik der Erde, Potsdam, East Germany) Gerlands Beitraege zur Geophysik (ISSN 0016-8696), vol. 95, 1986, p. 453-458. refs

Satellite laser ranging and orbital modeling of artificial satellites have both reached the sub-decimeter level of accuracy. The observations of satellite Lageos during the international MERIT-Campaign (September 1983-October 1984; about 30 stations) and the orbital model POTSDAM-5 were used to compute

a global station-coordinate set of high accuracy. Next, different methods for the determination of station motions are investigated. The data are used for an estimation of model accuracy as well as for determination of relative motion in a special case. Author

#### A87-34186

# THE DETERMINATION OF EARTH-ROTATION PARAMETERS FROM SATELLITE LASER RANGING (K VOPROSU OPREDELENIIA PARAMETROV VRASHCHENIIA ZEMLI PO LAZERNYM NABLIUDENIIAM ISZ)

I. M. TSIUPAK (L'vovskii Politekhnicheskii Institut, Lvov, Ukrainian SSR) Kinematika i Fizika Nebesnykh Tel (ISSN 0233-7665), vol. 3, Jan.-Feb. 1987, p. 78-83. In Russian. refs

A technique for determining earth-rotation parameters (ERP) from satellite laser ranging is described. Allowance is made for the influence of ERP on the calculated vector of the satellite's state and on the joint determination of the orbital parameters, pole coordinates, and sidereal time using a priori information. Lageos laser data obtained in the MERIT campaign are treated using the proposed technique.

#### A87-35308

# GEOCHRONOLOGICAL STUDIES OF STRANDLINES OF SAURASHTRA, INDIA, DETECTED BY REMOTE SENSING TECHNIQUES

M. BASKARAN, B. L. K. SOMAYAJULU (Physical Research Laboratory, Ahmedabad, India), BALDEV SAHAI, and R. K. SOOD (Indian Space Research Organisation, Space Applications Centre, Ahmedabad, India) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 169-176. refs

Using remote sensing techniques, four strandlines parallel to the present coastline were detected in the 16-18 km wide coastal belt of the Saurashtra peninsula in western India. Geochronological studies of the miliolites, the principal deposit of this area, using the Th-230/U-234 method, yielded ages ranging from 52 to 235 thousand years. With strong evidence in favor of tectonic instability in the region, the average uplift rates of the standlines are calculated to range from 0.12 to 0.58 mm/year.

#### A87-36126

# INTERNATIONAL CONFERENCE ON EARTH ROTATION AND THE TERRESTRIAL REFERENCE FRAME, COLUMBUS, OH, JULY 31-AUG. 2, 1985, PROCEEDINGS. VOLUMES 1 & 2

Conference sponsored by IAU, International Association of Geodesy, International Union of Geodesy and Geophysics, and International Council of Scientific Unions. Columbus, OH, Ohio State University (Reports on the MERIT-COTES Campaign on Earth Rotation and Reference Systems, Part II), 1986. Vol. 1, 428 p.; vol. 2, 444 p. For individual items see A87-36127 to A87-36177.

Reports are presented on the MERIT-COTES campaign on techniques in astrometry, satellite laser ranging, lunar laser ranging, very long baseline interferometry, and on combinations of techniques. Consideration is also given to short periodic and irregular variations in earth orientation parameters and atmospheric effects, intercomparisons of reference frames and standards, and future instrumentation and computational techniques for measuring earth rotation parameters. Papers are presented on the precision and accuracy of earth rotation determinations derived from optical astrometry, the performance of NASA laser ranging systems during MERIT. a stable method for estimation of laser ranging, a laser network designed for lunar ranging and earth satellite ranging, and combination of recent polar motion observations. Also included are papers on water storage effects on the earth's rotation, a geodetic intercomparison network for evaluating space techniques, reference frame intercomparisons, and polar motion-induced gravity.

#### A87-36164#

### GINFEST - GEODETIC INTERCOMPARISON NETWORK FOR EVALUATING SPACE TECHNIQUES

VIDAL ASHKENAZI (Nottingham University, England) IN: International Conference on Earth Rotation and the Terrestrial Reference Frame, Columbus, OH, July 31-Aug. 2, 1985, Proceedings. Volume 2. Columbus, OH, Ohio State University, 1986, p. 584-589.

Details are given of a geodetic network connecting the major radio telescopes and SLR facilities in Western and Central Europe, which is to be used in a co-location exercise involving VLBI, CERI, SLR observations, with the aim of evaluating the relative accuracies and system biases of these geodetic space observation techniques.

### A87-36166\*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

### CREATION OF A GLOBAL GEODETIC NETWORK USING MARK

CHOPO MA, THOMAS A. CLARK, and JAMES W. RYAN (NASA, Goddard Space Flight Center, Greenbelt, MD) IN: International Conference on Earth Rotation and the Terrestrial Reference Frame, Columbus, OH, July 31-Aug. 2, 1985, Proceedings. Volume 2. Columbus, OH, Ohio State University, 1986, p. 601-608. refs

The positions of 15 permanent VLBI stations have been determined using Mark III with one-sigma uncertainties of less than 5 cm except for three stations in the Pacific. 46070 delay/delay rate observations acquired by the Crustal Dynamics Project and Polaris/IRIS from 1980-84 were included in a least squares solution to estimate the station positions, 44 radio source positions, and earth orientation parameters.

### A87-36176\*# Colorado Univ., Boulder. POLAR MOTION-INDUCED GRAVITY

JOHN M. WAHR (Colorado, University, Boulder) IN: International Conference on Earth Rotation and the Terrestrial Reference Frame, Columbus, OH, July 31-Aug. 2, 1985, Proceedings. Volume 2. Columbus, OH, Ohio State University, 1986, p. 736-741. refs (Contract NAS5-27644)

Variations in the geocentric position of the earth's rotation axis (polar motion) cause deformation within the earth. The effects of this deformation on surface gravity and on radial and horizontal positions of points on the earth's surface are estimated. The effects of the oceans and of the earth's anelasticity on this deformation are found to be negligible. Peak-to-peak variations in surface gravity of 10 microgals or more, and in radial motion of 1-2 cm are possible over six months or so. These numbers are small enough that they can probably not be used to learn about the earth; however, they are large enough to noticeably affect present high-quality geodetic observations.

#### A87-37918

#### GLOBAL IMAGES OF THE EARTH'S INTERIOR

ADAM M. DZIEWONSKI and JOHN H. WOODHOUSE (Harvard University, Cambridge, MA) Science (ISSN 0036-8075), vol. 236, April 3, 1987, p. 37-48. refs

(Contract NSF EAR-81-20944; NSF EAR-82-13330; NSF EAR-83-17594; NSF EAR-84-18332; NSF EAR-85-11400)

Global seismic imaging is reviewed. The systematic and rapid progression away from the spherically symmetric earth models developed during the first three quarters of this century is recalled, showing the progression toward three-dimensional maps of the earth's interior which now span regions from the bottom of the crust to the inner core of the earth. The surprising finding is addressed that the inner core appears to be anisotropic with the axis of symmetry aligned with the axis of rotation.

A87-41380\* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### GPS-BASED GEODESY IN CALIFORNIA, MEXICO AND THE CARIBBEAN

W. G. MELBOURNE, T. H. DIXON, J. M. DAVIDSON, and C. L. THORNTON (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: PLANS '86 - Position Location and Navigation Symposium, Las Vegas, NV, Nov. 4-7, 1986, Record . New York, Institute of Electrical and Electronics Engineers, 1986, p. 219-229. refs

Thw NASA GPS-based geophysical geodetics system will be capable of 1-3 cm relative position accuracies on regional baselines and GPS ephemerides with submeter accuracies. Simultaneity and mutual visibility allow high differential carrier phase and group delay measurements to be obtained without clock errors. Both mobile GPS terminal sites and fiducial sites whose locations are accurately maintained by independent VLBI and SLR systems are to be used. A system validation and multiyear measurement program is under way.

#### A87-41383

# USING THE GLOBAL POSITIONING SYSTEM (GPS) FOR HIGH PRECISION GEODETIC SURVEYS - HIGHLIGHTS AND PROBLEM AREAS

G. BEUTLER, W. GURTNER, M. ROTHACHER, T. SCHILDKNECHT, and I. BAUERSIMA (Bern, Universitaet, Switzerland) IN: PLANS '86 - Position Location and Navigation Symposium, Las Vegas, NV, Nov. 4-7, 1986, Record . New York, Institute of Electrical and Electronics Engineers, 1986, p. 243-250. refs

Although only partially deployed the GPS could be applied successfully to a big variety of high precision surveys ranging from the measurement of short ultra-precise terrestrial baselines to the establishment of networks of continental size. This development is illustrated with a typical example for small-scale surveys (CERN-LEP control net) and two for large scale surveys (1984 Alaska GPS experiment and 1985 High precision baseline test /HPBL-test/). Typical problem areas (atmospheric refraction effects, orbit quality) are discussed. The accuracy obtainable with GPS today is demonstrated by comparison with terrestrial surveys for the small networks, with VLBI measurements for large networks.

**N87-20618** Bayerische Akademie der Wissenschaften, Munich (West Germany). Bayerische Kommission fuer die Internationale Erdmessung.

REPORT ON THE SPECIAL PROGRAM 78 SATELLITE GEODESY OF THE TECHNICAL UNIVERSITY OF MUNICH Progress Report, 1984-1985 [DIE ARBEITEN DES SONDERFORSCHUNGSBEREICHES 78 SATELLITENGEODAE-SIE DER TECHNISCHEN UNIVERSITAET MUENCHEN 1984 UND 1985]

MANFRED SCHNEIDER 1986 346 p In GERMAN (ASTRON-GEODAET-ARB-48; ISBN-3-7696-9791-X; ISSN-0340-7691; ETN-87-98974) Avail: Issuing Activity

In the project, laser range finding software and sequential storage system development for satellite observation, the thermal behavior and radiation quality of an Nd-glass slab laser, laser and receiver developments, and a concept for a Moon and satellite laser range finder were studied. A mobile laser range finder was examined. The operation and development of a receiver unit for radio interferometry was investigated. Microwave Doppler and global positioning measurements were performed. Universal time, terrestrial, meteorological, and seismological supplemental measurements were conducted. Gradiometer concepts were examined. The influence of lithosphere boundary waves on the geoid was studied. In the field of the Earth-Moon systems dynamics ephemeride calculations, satellite orbits and laser time-of-flight, satellite gradiometry, the Newton-Euler equation of motion, and relativistic effects were investigated. The astrometric and geodetic-geophysical application of interferometric methods was examined. **ESA** 

N87-22282# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

REPORTS ON CARTOGRAPHY AND GEODESY, SERIES 1, NUMBER 96 (NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN, REIHE 1, HEFT NR. 96)

1985 40 p In GERMAN, ENGLISH and FRENCH

(ISSN-0469-4236; ETN-87-99328) Avail: NTIS HC A03/MF A01

A collocation experiment with laser systems and a time-transfer experiment as well as the timing-system of the ground station are described. A reconstitution of the graphic triangulation procedure of the Dutch cartographer, Jacob van Deventer (1500 to 1575) is given.

**ESA** 

N87-22286# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

REPORTS ON CARTOGRAPHY AND GEODESY, SERIES 1, NUMBER 97 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN, REIHE 1, HEFT 97]

1986 111 p In GERMAN, ENGLISH and FRENCH

(ISSN-0469-4236; ETN-87-99329) Avail: NTIS HC A06/MF A01 Developments of digital and graphic program systems used for cartography and geodesy are presented. Systems of digital image processing, like the Vicom system and their application in navigation, orthophotomapping, and thematic cartography are discussed. Possibilities of map-projection, such as the development from digital to analog maps are shown. Research activities and fields of application, including regional planning engineering-geodesy as well as the establishment of an official computerized topographic cartographic information (TOPKIS) are outlined.

**ESA** 

N87-22290# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE VICOM SYSTEM FOR DIGITAL IMAGE PROCESSING AT THE INSTITUTE OF CARTOGRAPHY OF TECHNICAL UNIVERSITY, HANOVER (WEST GERMANY) [DIE VICOM-ANLAGE ZUR DIGITALEN BILDVERARBEITUNG BEIM INSTITUT FUER KARTOGRAPHIE (IFK) DER UNIVERSITAET HANNOVER!

ERNST JAEGER *In its* Repts. on Cartography and Geodesy, Series 1, No. 97 p 41-49 1986 In GERMAN; ENGLISH and FRENCH summaries

Avail: NTIS HC A06/MF A01

The VICOM system is used for automatic digitizing of cadastral and topographic maps as an alternative to manual digitizing. Hardware and software components of an image processing system for application of processes which can increase the system efficiency are described. Research activities in digital image processing, using the VICOM system, are discussed.

N87-23018\*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

QUICK-LOOK GUIDE TO THE CRUSTAL DYNAMICS PROJECT'S DATA INFORMATION SYSTEM

CAREY E. NOLL, JEANNE M. BEHNKE, and HENRY G. LINDER Jun. 1987 82 p

(NASA-TM-87818; NAS 1.15:87818) Avail: NTIS HC A05/MF A01 CSCL 08G

Described are the contents of the Crustal Dynamics Project Data Information System (DIS) and instructions on the use of this facility. The main purpose of the DIS is to store all geodetic data products acquired by the Project in a central data bank and to maintain information about the archive of all Project-related data. Access and use of the DIS menu-driven system is described as well as procedures for contacting DIS staff and submitting data requests.

N87-23033\*# Texas Univ , Austin. Center for Space Research.
ALTIMETER MEASUREMENTS FOR THE DETERMINATION OF
THE EARTH'S GRAVITY FIELD Annual Research Technical
Report, 18 Mar. 1986 - 14 Mar. 1987

B. D. TAPLEY, B. E. SCHUTZ, and C. K. SHUM 29 Apr. 1987

(Contract NAG5-746)

(NASA-CR-180520; NAS 1 26:180520) Avail: NTIS HC A02/MF A01 CSCL 08G

The ability of satellite-borne radar altimeter data to measure the global ocean surface with high precision and dense spatial coverage provides a unique tool for the mapping of the Earth's gravity field and its geoid. The altimeter crossover measurements, created by differencing direct altimeter measurements at the subsatellite points where the orbit ground tracks intersect, have the distinct advantage of eliminating goold error and other nontemporal or long period oceanographic features. In the 1990's, the joint U.S./French TOPEX/POSEIDON mission and the European Space Agency's ERS-1 mission will carry radar altimeter instruments capable of global ocean mapping with high precision. This investigation aims at the development and application of dynamically consistent direct altimeter and altimeter crossover measurement models to the simultaneous mapping of the Earth's gravity field and its geoid, the ocean tides and the guasi-stationary component of the dynamic sea surface topography. Altimeter data collected by SEASAT, GEOS-3, and GEOSAT are used for the investigation

### 04

### **GEOLOGY AND MINERAL RESOURCES**

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

**A87-31410\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SHUTTLE IMAGING RADAR (SIR-B) INVESTIGATIONS OF THE CANADIAN SHIELD - INITIAL REPORT

PAUL D. LOWMAN, JR. (NASA, Goddard Space Flight Center, Greenbelt, MD), JEFF HARRIS (F. G. Bercha and Associates, Ltd., Calgary, Canada), PENNY M. MASUOKA (Science Applications Research, Lanham, MD), VERNON H. SINGHROY (Ministry of National Resources, Ontario Centre for Remote Sensing, Toronto, Canada), and VERNON ROY SLANEY (Geological Survey of Canada, Mineral Resource Div., Ottawa) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, Jan. 1987, p. 55-66. refs

Two of the 43 Shuttle Imaging Radar (SIR-B) experiments carried out from the 41-G shuttle mission in 1984 involved a 2600-km swath across the Canadian Shield, with the objectives of studying the structure of province boundaries and developing techniques for the geologic use of orbital radar. Despite degraded single incidence angle imagery resulting from system problems, valuable experience has been obtained with data over a test site near Bancroft, Ontario. It has been found that even subdued glaciated topography can be effectively imaged, variations in backscatter being caused by variations in local incidence andle rather than shadowing. It has been demonstrated that small incidence angles are more sensitive to topography than large angles. Backscatter is extremely sensitive to look direction, topographic features nearly normal to the illumination being highlighted, and those nearly parallel to it being suppressed. It is concluded that orbital radar can provide a valuable tool for geologic studies of the Canadian Shield and similar areas, if suitable look angles and at least two look directions can be utilized for each area

#### A87-32478

### EXPLORATION OF GEOMAGNETIC FIELD ANOMALY WITH BALLOON FOR GEOPHYSICAL RESEARCH

WEN-KUI JIA (Chinese Academy of Sciences, Space Science and Technology Center, Beijing, People's Republic of China). IN International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1503-1509.

The use of a balloon to explore the geomagnetic field anomaly in the area east of Beijing is demonstrated. The present results are compared with those of aerial surveys. Descriptions are given of the fluxgate magnetometer, the sensor's attitude control and measurement, and data transmission and processing. At an altitude of about 30 km, a positive anomaly of the vertical component of about 100 nanoteslas was measured. The results suggest that, for this particular area, the shallow layer of a small-scale geological structure differs from the deep layer of a large-scale geological structure.

### A87-35522

### MID-INFRARED REMOTE SENSING SYSTEMS AND THEIR APPLICATION TO LITHOLOGIC MAPPING

JOHN E. EBERHARDT, JOHN G. HAUB (CSIRO, Lucas Heights Research Laboratories, Australia), ANDREW A. GREEN (CSIRO, Div. of Mineral Physics and Mineralogy, North Ryde, Australia), RONALD J. P. LYON (Stanford University, CA), and ARTHUR W. PRYOR (Macquarie University, North Ryde, Australia). IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 230-237. refs

Mid-infrared remote lithologic mapping by emittance and by reflectance are assessed in laboratory experiments. The emittance spectra of various rocks and minerals, measured in the 8-13-micron atmospheric transmission window, are compared with reflectance data measured in the range of 9.2-11.2-micron using a line-tuned CO2 laser. It is concluded that the reflectance data are more useful for lithologic discrimination than the passive emittance data. An experimental laser suitable for terrain mapping from a low-flying aircraft is described. The low-pressure longitudinal discharge CO2 laser has a rotating mirror to scan the diffraction grating and generates 90 bursts of pulses per second. Each 1-ms burst contains 92 pulses at 92 CO2 laser wavelengths. The mean output power is 12 W and the average pulse power is 370 W. With that power, and using incoherent detection, a signal-to-noise ratio of better than 100:1 should be obtained from terrain with an albedo of 0.01 at a height of 500 m. Author

### A87-36104

THE GEOMETRY OF THE INTERSECTIONS OF TECTONIC STRUCTURES DETECTED ON SATELLITE IMAGES GEOMETRICHESKIE PERESECHENIIA TEKTONICHESKIKH STRUKTUR, VYIAVLIAEMYKH NA KOSMICHESKIKH SNIMKAKH)

M. I. BURLESHIN (Proizvodstvennoe Geologicheskoe Ob'edinenie Gidrospetsgeologiia, Moscow, USSR) — Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 32-37. In Russian. refs

Using a number of interpreted satellite images of the Turan platform, four groups of tectonic structures were identified: structures oriented either longitudinally or transversely with respect to the basic folding pattern of the platform, structures that are intermediate between the longitudinal and transverse structures, and ring structures. These structures were seen to intersect forming two types of intersections. The first type comprises intersections between the longitudinal, transverse, and intermediate structures, forming orthogonal, diagonal, or complex patterns. The second type includes those between the longitudinal riling structures. These types of intersections can have 'superimposed', 'enclosed', and 'displaced' configurations. The correlations between the intersection patterns observed and the geological features of the area are discussed.

#### A87-36105

THE GEOSTRUCTURAL CHARACTERISTICS OF THE RIFT ZONE ON THE LAMBERT GLACIER (ANTARCTICA) ACCORDING TO SPACE IMAGES (OSOBENNOSTI GEOLOGICHESKOGO STROENIIA RIFTOVOI ZONY LEDNIKA LAMBERTA /ANTARKTIDA/ PO DANNYM DESHIFRIROVANIIA KOSMICHESKIKH SNIMKOV)

V. M. BUDKO and V. S. SHALAEV (Proizvodstvennoe Geologicheskoe Ob'edinenie Aerogeologiia, Leningrad, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 38-47. In Russian. refs

Cosmos-satellite images of the Lambert glacier rift zone were interpreted to reveal the zone's geological features. A schematic map (on the scale of 1:1,000,000) of faults and tectonic structures compiled on the basis of the interpreted images reveals about 10 ring structures and an ancient tectonic zone. Two types of faults were identified on the map: the first comprising the disjunctions forming the largest grabens, or riftogenic faults; and the second comprising all other dislocations. Statistical analysis of the interpretation results has demonstrated good agreement between predicted and identified faults. The ore-controlling significance of the ancient tectonic zone (dating to the Ross Orogeny) is inferred.

#### A87-36525

# FAULT PATTERNS BY SPACE REMOTE SENSING AND THE ROTATION OF WESTERN OREGON DURING CENOZOIC TIMES

MICHEL CHAPLET, JEAN CHOROWICZ, and FRANCOIS ROURE (Paris VI, Universite, France) Earth and Planetary Science Letters (ISSN 0012-821X), vol. 81, no. 4, Feb. 1987, p. 425-433. refs

MSS-Landsat images (bands 6 and 7) as well as previous studies were used to interpret fault patterns in western Oregon in terms of the rotations detected by paleomagnetism. These fault zones show a great concentration between the Cascade Range and the Idaho Batholite and have several distinct trends. The north-south striking structures are attributed to the Basin and Range province, while the large NW-SE right-lateral fault zones are interpreted as resulting from an extension between the Cascades Arc and the Olympic-Wallowa lineament. The latter was a paleoplate boundary during pre-Eocene times. This extension, beginning during Late Eocene/Oligocene times and continuing through recent times, is accompanied by a migration of the rotation pole from southeast to northwest, and by a clockwise rotation of the Coast Range-Klamath Mountain-Cascde Range block, induced by the subduction of the Farallon plate.

### A87-36925

FIRST RESULTS OF LATERITIC COVER MAPPING WITH SPOT IMAGES THE KANGABA REGION (SOUTH-MALI) [PREMIERS RESULTATS DE CARTOGRAPHIE DES COUVERTURES LATERITIQUES PAR IMAGES SPOT, REGION DE KANGABA (SUD-MALI)]

CLAUDE ROQUIN, TOUNDE DANDJINOU, PHILIPPE FREYSSINET, JEAN-CLAUDE PION, and YVES TARDY (CNRS, Centre de Sedimentologie et de Geochimie de la Surface, Strasbourg, France) Academie des Sciences (Paris), Comptes Rendus, Serie II Mecanique, Physique, Chimie, Sciences de l'Univers, Sciences de la Terre (ISSN 0249-6305), vol. 304, no. 8, Feb. 28, 1987, p. 321-326. In French. CNES-supported research.

A detailed mapping method is applied to multispectral SPOT images of the Kangaba region of South-Mali obtained on April 5, 1986, and the relationship between lateritic landscapes and the mineral and element contents of the soil is successfully demonstrated. The process distinguishes between the sandy surface deposits in the thalwegs which are rich in quartz and sparse in vegetation, and the ferruginous duricrusts on the plateaus whose vegetation density varies with kaolinite content. The study reveals elements relating the geochemical evolution of duricrusts to the surface drainage conditions and the development of vegetation cover.

#### A87-39186

PREDICTING THE LOCATION OF KIMBERLITE FROM A PROBABILITY ANALYSIS OF LINEAR STRUCTURE ON REMOTE SENSING DATA

PIN-QING WANG (Centre for Remote Sensing in Geology, Beijing, People's Republic of China) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 417-426. refs

The relation between linear structure and mineral deposits is examined. The use of linear structure on a remote sensing image to predict the location of kimberlite is described. Statistical analysis and probability calculations are applied to remote sensing images of a test site in northeastern China. A probability contour map of kimberlite in the area is derived, and a correlation between the kimberlite locations and the linear structure distributions from the remote sensing images is detected.

#### A87-39193

### A SOFTWARE DEFOLIANT FOR GEOLOGICAL ANALYSIS OF BAND RATIOS

S. J. FRASER and A. A. GREEN (CSIRO, Div. of Mineral Physics and Mineralogy, North Ryde, Australia) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 525-532. Research sponsored by the Australian Mineral Industries Research Association. refs

Vegetation impedes the geological analysis of band ratio images, because it is both widely distributed in the surficial environment and can be spectrally similar to ferric oxides and clays when sampled by broad-band imaging devices. This problem is addressed by a technique called 'directed principal component analysis' (DPCA) that involves calculating principal components on two input band ratio images. One ratio is a geological discriminant, confused by the presence of vegetation; the second ratio is chosen for its suitability as a vegetation index. Once computed, the second DPC has the properties of a geological discriminant, but is less influenced by vegetation. The effects of vegetation, which are strongly correlated between the two input ratios, contribute chiefly to the first DPC. This simple method, applied selectively to airborne thematic mapper data, substantially reduces the effects of vegetation.

#### A87-39468

HIGH RESOLUTION REMOTE SENSING OF SPATIALLY AND SPECTRALLY COMPLEX COAL SURFACE MINES OF CENTRAL PENNSYLVANIA - A COMPARISON BETWEEN SIMULATED SPOT MSS AND LANDSAT-5 THEMATIC MAPPER

NANCY F. PARKS, GARY W. PETERSEN, and GEORGE M. BAUMER (Pennsylvania State University, University Park) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, April 1987, p. 415-420. refs (Contract DE-AC02-83ER-60182)

### A87-39790

SPACELAB DATA - A NEW CONTRIBUTION FOR STRUCTURAL INTERPRETATIONS OF REMOTELY SENSED DATA IN GEOLOGY

ANNICK BLUSSON (Paris XI, Universite, Orsay; IBM France, S.A., Centre Scientifique, Paris) Earth, Moon, and Planets (ISSN 0167-9295), vol. 38, May 1987, p. 1-11. CNES-CNRS-supported research. refs

This study deals with the comparison between Landsat MSS usual data, extensively used in the past, and new Spacelab photographs for geological application. Both data have been processed, but the best results were obtained by interpreting original data. Classical image processing techniques were applied but they did not help much apart from geometrical correction which is essential for Landsat MSS images. Geological and structural interpretations were conducted for both types of data and compared. The results show that, even if Landsat MSS images provide a good approach for geological mapping, Spacelab photos allow more accurate and detailed interpretations. This is mostly fue to the 20-meters resolution of the photos (80 meters for Landsat), and also to the potentiality of stereoscopic view (not immediate with Landsat). Spacelab data seem to be today the

best document a geologist can use to produce geologic and structural maps.

N87-22319\* Bechtel National, Inc., San Francisco, Calif.
TECTONIC EVALUATION OF THE NUBIAN SHIELD OF
NORTHEASTERN SUDAN USING THEMATIC MAPPER
IMAGERY Final Report

CAROL TOSAYA, DAVID HARNISh, and RICHARD DAY Apr. 1987 255 p. Original contains color illustrations Document contains maps as supplements

(Contract NAS5-28757)

(NASA-CR-180575; NAS 1.26:180575) Avail: Issuing Activity CSCL 08B

Owing to the size, inaccessibility, and harsh, arid climate of the Red Sea Hills, remotely sensed satellite imagery is well suited for analysis of the region. An area of approximately 125,000 sq km of the northernmost Red Sea Hills, which contains the greatest amount of published geologic data using LANDSAT Thematic Mapper (TM) imagery was selected. The regional structure and lithotectonic provinces were defined and delineated. The tectonic evolution of the Nubian Shield was evaluated based on the image interpretation and the compiled tectonic maps.

B.G.

N87-24043# Texas Univ., Austin. Bureau of Economic Geology.

LANDSAT-BASED LINEAMENT ANALYSIS, EAST TEXAS BASIN, AND STRUCTURAL HISTORY OF THE SABINE UPLIFT AREA, EAST TEXAS AND NORTH LOUISIANA Topical Report, Mar. 1984 - Nov. 1986

R. W. BAUMGARDNER and M. L. W. JACKSON 2 Mar. 1987 128 p

(Contract GRI-5082-211-0708)

(PB87-176327; GRI-87/0077) Avail: NTIS HC A07/MF A01 CSCL 08G

The relationship between subsurface structure and lineaments was examined. More than 2,200 lineaments were mapped from 1:250,000-scale LANDSAT images. Vector sums of greater-than-average values of length-weighted frequency define significant peaks of lineament orientation. For all lineaments, significant peaks occur at 325 degrees and 21 degrees. The northwest peak parallels mean azimuth of borehole elongations in Cotton Valley sandstone wells throughout East Texas. Lineament density delineates major fault zones. These results suggest that lineaments and subsurface structures results from like-oriented stresses. Identification of the timing, extent, and orientation of arching episcies in the Sabine Uplift areas is important in developing a structural history of the area.

### 05

### **OCEANOGRAPHY AND MARINE RESOURCES**

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

#### A87-31572#

### A CURIOUS SEA-SURFACE-TEMPERATURE PHENOMENON OBSERVED BY METEOSAT

D. R. KINDRED (ESA, European Space Organizations Centre, Darmstadt, West Germany) ESA Bulletin (ISSN 0376-4265), no. 48, Nov. 1986, p. 43-49.

Meteosat data processing procedures are described, noting their application to a sea surface-temperature (SST) anomaly observed on Aug. 26, 1985. SSTs are mainly determined from water vapor band data corrected atmospheric absorption. Several SSTs are acquired to form a composite image of the slowly-varying condition, and compared with reference fields developed from previously measured fields and, as an option, in situ ship data. The anomaly consisted of Mediterranean SSTs 5-10 C above those expected. Cool, fresh maritime air had entered the western Mediterranean,

accompanied by 15 kt surface winds, while the existing pressure gradient allowed quiet, calm hot weather to remain in the eastern Mediterranean. The passage of the frontal system caused significant mixing of the waters of the western region, thereby invalidating much of the SST data.

M.S.K.

#### A87-31592

### WEST ANTARCTIC ICE STREAMS DRAINING INTO THE ROSS ICE SHELF CONFIGURATION AND MASS BALANCE

SION SHABTAIE and CHARLES R. BENTLEY (Wisconsin, University, Madison) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 10, 1987, p. 1311-1336. refs (Contract NSF DPP-81-20332; NSF DPP-84-12404)

Airborne radar sounding data, collected in 1984-1985, for the West Antarctic inland ice sheet, the Ross Ice Shelf, and the Crary Ice Rise are examined, and utilized to map the boundaries of the ice streams and their flow bands on the Ross Ice Shelf. In order to relate surface elevation data from satellite observations to sea level, three geoidal models (GEM 9, 10, and 10C) are evaluated by comparing them with elevations obtained from a hydrostatic model. The best correlation was observed between the GEM 10C model and the hydrostatic model with a difference of only 0.4 + or - 2.7 m. Consideration is given to the mass balance of the inland ice and of the Ross Ice Shelf. The surface elevation map derived with these data reveal that: (1) the three streams are up to 500 km long; (2) the surface of the streams A and B are crevassed and the boundaries are marked by chaotic, incoherent bands of surface crevasses; however, stream C has no crevasses; and (3) streams A and B overlie a deep subglacial channel and stream C is over a smoother and shallower subglacial trough. The overall net balance for this portion of the West Antarctic inland ice is estimated as -23 + or - 15 cu km/yr, and the volume melt rate for the Ross Ice Shelf is calculated as 60 + or - 15 cu km/yr, corresponding to a mean melt rate of 0.12 + or - 0.03 m/yr.

#### A87-31631

### VHF RADAR FOR OCEAN SURFACE CURRENT AND SEA STATE REMOTE SENSING

P. BROCHE, P. FORGET, J. C. DE MAISTRE, J. L. DEVENON, and M. CROCHET (Toulon et Var, Universite, Toulon, France) Radio Science (ISSN 0048-6604), vol. 22, Jan.-Feb. 1987, p. 69-75. Research supported by the Institut National d'Astronomie et Geophysique, Conseil Regional de Provence-Cote d'Azur, and CNRS. refs

A meteorological ST radar operating at a frequency of 47.8 MHz has been used for remote sensing of sea state. General features of the Doppler spectra of the echoes are found to be the same as those obtained at HF; however, space resolution and intrinsic accuracy of the current velocity measurements can be significantly improved. Arguments are presented to suggest a potential range of a few tens of kilometers on the open sea if the full capabilities of ST radars are used. The experiment also shows that, when it is possible, the range could be extended by increasing the altitude of the radar.

### A87-32097

### MEASUREMENT OF THE SURFACE EMISSIVITY OF TURBID WATERS

WEN-YAO LIU, R. T. FIELD, R. G GANTT, and V. KLEMAS (Delaware, University, Newark) Remote Sensing of Environment (ISSN 0034-4257). vol. 21, Feb. 1987, p. 97-109. refs (Contract NSF CEE-82-10857)

Knowledge of sea surface emissivity is an important factor in measuring valid thermal IR radiometric temperatures from viewing positions both near the sea surface and from satellite platforms. In the latter case, it is found that the effect of as little as a 0.01 change in emissivity from a blackbody assumption may create an increase of as much as 1.0 C in recovered temperature in dry atmospheres, where recovered temperatures are radiometric temperatures obtained by applying the Planck function to radiances received at the satellite. As atmospheric moisture increases to around 5 g/sq cm variations in emissivity of the same order have

negligible effect on recovered sea surface temperatures. Laboratory measurements of fresh (tap) and sea water samples with a Barnes 8-14 micron PRT-5 radiometer show distinctive differences in the behavior of emissivity with changes in suspended sediment concentrations for both organic and inorganic materials. Tap water emissivity remains essentially invariant at 0.980 over a wide range of concentrations. In contrast, however, sea-water emissivity values show an immediate but steady decrease from 0.975 to a value 0.970, with increasing suspended sediment loading up to around 100 mg/l, where emissivity levels off until it falls again to a value of 0.962 at concentrations of 10,000 mg/l. Consequently, emissivity variations should not be neglected in making thermal measurements of coastal waters.

#### A87-32490

### AUSTRALIAN UTILIZATION AND RESEARCH INTO REMOTE SENSING

KENNETH G. MCCRACKEN (CSIRO, Office of Space Science and Applications, Canberra, Australia) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2 . Tokyo, AGNE Publishing, Inc., 1986, p. 1587-1592. refs

Uses of remote sensing (by the NOAA, NIMBUS, Landsat, Shuttle, and ARGOS-system instruments) in the mapping and management of the Australian continent are discussed together with recent research results and important research initiatives. Particular attention is given to the results obtained in mapping ocean currents and reefs and in predicting the areas of highest erosion risk. Recent results indicate that large long-lived eddies in the Tasman Sea exhibit angular momenta that vary as the 1.8th power of radius; in addition, a major new current system was discovered that travels along the southern coastline of the Australian continent. Based on Landsat data, a classification procedure was developed that provides bathymetric and geomorphological classifications of coral reefs, and an autocorrelation technique is being developed to quantify erosion in arid range lands.

#### A87-32497

### MONITORING OF SNOW AND ICE IN HOKKAIDO ISLAND USING MULTITEMPORAL NOAA-AVHRR DATA

SHOJI TAKEUCHI, KANAME TAKEDA (Remote Sensing Technology Center of Japan, Tokyo), and HIROAKI OCHIAI (Toba Merchant Marino College, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2 . Tokyo, AGNE Publishing, Inc., 1986, p. 1637-1642.

#### A87-32499

### MARINE OBSERVATION SATELLITE-1 (MOS-1)

YOSHIHIRO ISHIZAWA, TAKESHI MASUDA, and SUSUMU YOSHITOMI (National Space Development Agency of Japan, Tokyo). IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1651-1657.

The MOS-1 satellite, Japan's first remote sensing satellite, was scheduled for launch in early 1987 on-board the NASDA N-II launch vehicle. MOS-1 is to be used as a testbed for earth observation technologies, perform remote sensing of the sea and atmosphere, and enable basic research on a data acquisition system. Designed for a 2 yr lifetime, the satellite carries a multispectral electronic self-scanning radiometer, a visible and thermal IR radiometer, and a microwave scanning radiometer. The spacecraft is three axis stabilized with a controlled bias momentum apparatus. The instrumental operational components and performance capabilities, telemetry systems and ground segment are summarized. M.S.K.

#### A87-32503

#### THE FRENCH SPACE OCEANOGRAPHY PROGRAM

JEAN-LOUIS FELLOUS IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1689-1692.

The French Space Oceanography Program, aimed at improving current knowledge and understanding of the oceans and their role in climate, and at promoting potential applications of ocean observations from space, involves a series of flight instruments and dedicated satellite missions. Projects currently under development such as TOPEX-POSEIDON (a satellite system designed to make accurate, global measurements of the surface topography of the oceans) and ESA's ERS-1 are discussed in detail. Other projects of interest for space oceanography are the ARGOS data collection and platform location satellite system, and the first SPOT high resolution visible imagery satellite.

### A87-32770\* Texas Univ., Austin.

### BIHARMONIC SPLINE INTERPOLATION OF GEOS-3 AND SEASAT ALTIMETER DATA

DAVID T. SANDWELL (Texas, University, Austin) Geophysical Research Letters (ISSN 0094-8276), vol. 14, Feb. 1987, p. 139-142. refs

(Contract NAG5-787)

An algorithm is presented for determining the minimum curvature surface passing through a set of nonuniformly spaced data points. The curve is generated as a linear combination of Green functions for the biharmonic operator at each data point, with the amplitudes of the functions adjusted so that the interpolating surfaces passes through each point. The function passing through the points can be regarded as a spline to which point forces are applied, defining the minimum curvature between the points. The technique was used to combine the along track slopes of the GEOS-3 and Seasat altimeter data into a consistent geoid height map of the Caribbean area, covering 0.5 million data points in the process. Sample images are provided and new topographic features that are revealed are discussed.

#### A87-32951

### CORAL REEF REMOTE SENSING APPLICATIONS

DEBORAH A. KUCHLER, DAVID L. B. JUPP (CSIRO, Div. of Water and Land Resources, Canberra, Australia), DANIEL B. VAN R. CLAASEN (Great Barrier Reef Marine Park Authority, Townsville, Australia), and WILLIAM BOUR (Office de la Recherche Scientifique et Technique d'Outre-Mer, Noumea, New Caledonia) Geocarto International, no. 4, 1986, p. 3-15. Research supported by the Great Barrier Reef Marine Park Authority. refs

The application of remote sensing technology to coral reef research, management, and development is discussed. Consideration is given to reef geography, reef form, surface cover, vegetation, and oceanography. The remotely sensed data are utilized to provide information for coral reef resource assessment, to plan and map shipping routes, to locate potential fishing grounds, to study water circulation patterns, to analyze reef topography and morphology, and to develop maps of reef covers and reef vegetation. The use of remote sensing data in coral calcification and accretion studies is examined.

#### A87-32976#

### OBSERVATIONS OF INTERMITTENT CUMUL'IS CONVECTION IN THE BOUNDARY LAYER

BURGHARD BRUEMMER (Hamburg, Universitaet, West Germany) and MELCHIOR WENDEL (Max-Planck-Institut fuer Meteorologie, Hamburg, West Germany) Royal Meteorological Society, Quarterly Journal (ISSN 0035-9009), vol. 113, Jan. 1987, p. 19-36. refs

During the September 1, 1978 radiosonde and tethered balloon measurements performed for the 1978 Joint Air Sea Interaction in the NE Atlantic, two cloud layers (cumulus below stratocumulus) were observed below an inversion at about 900 m. Cumulus clouds alternately appeared and disappeared; on September 1, a relatively large vertical shear was observed together with an inflection point in the profile of the wind component normal to the mean wind

direction. The small air-sea temperature difference and large dynamical contribution to cloud generation suggest an interaction between large scale processes generating a favorable mean wind shear profile and dynamically forced convection. The relative airflow in and around active cumulus clouds was characterized by updrafts within the clouds and downdrafts at the cloud edges; the thermodynamic properties of these phenomena are discussed.

O.C.

A87-32982\*# Purdue Univ., West Lafayette, Ind.

CONVECTIVE HEATING AND PRECIPITATION ESTIMATES FOR THE TROPICAL SOUTH PACIFIC DURING FGGE, 10-18 JANUARY 1979

BERNARD L. MILLER and DAYTON G. VINCENT (Purdue University, West Lafayette, IN) Royal Meteorological Society, Quarterly Journal (ISSN 0035-9009), vol. 113, Jan. 1987, p. 189-212. NOAA-supported research. refs (Contract NAS8-35187; NSF ATM-84-05748)

Heat and moisture budgets are computed during part of the FGGE Special Observing Period-1 for an area containing the South Pacific convergence zone, deriving 12-hour precipitation rate estimates as residuals and comparing them with those derived from a GOES IR technique. Heat budget estimates are generally in good agreement with the IR estimates; the axis of maximum precipitation derived from the heat budget is well aligned with the lowest values of outgoing long wave excitation, which represent high, cold cloud tops resulting from deep cumulus convection. The vertical advection term is found to be the dominant term in the heat budget; this, together with radiative cooling, yields the approximate balance between adiabatic cooling and diabatic heating.

**A87-33430°** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

OH MEASUREMENT NEAR THE INTERTROPICAL CONVERGENCE ZONE IN THE PACIFIC

L. I. DAVIS, JR., JOHN V. JAMES, CHARLES C. WANG (Ford Motor Co., Dearborn, MI), CHUAN GUO, PETER T. MORRIS (Wayne State University, Detroit, MI), and JACK FISHMAN (NASA, Langley Research Center, Hampton, VA) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 20, 1987, p. 2020-2024. NASA-DOE-supported research. refs

Airborne measurements of OH were made near the Intertropical Convergence Zone in the Pacific, and the averaged results for each data run were compared with those calculated from a photochemical model. The measured OH concentrations were found to vary along the flight path. Possible causes for the observed variations are discussed.

Author

**A87-33431\*** National Center for Atmospheric Research, Boulder,

MEASUREMENTS OF NITRIC OXIDE IN THE BOUNDARY LAYER AND FREE TROPOSPHERE OVER THE PACIFIC OCEAN

B. A. RIDLEY (National Center for Atmospheric Research, Boulder, CO), M. A. CARROLL (Cooperative Institute for Research in Environmental Sciences, Boulder, CO), and G. L. GREGORY (NASA, Langley Research Center, Hampton, VA) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 20, 1987, p. 2025-2047. NASA-NSF-supported research.

Measurements of NO and O3 are presented from 13 aircraft flights made over the Pacific Ocean in the autumn of 1983 during one phase of the NASA Global Tropospheric Experiment. All of the flights were made between 15 deg and 42 deg N and from the coast of California to west of the Hawaiian Islands. Within the upper marine boundary layer the median daytime mixing ratio of NO was near 1 part per trillion by volume (pptv). Values of NO less than 10 pptv were often observed up to altitudes near 6 km. Thus for the location and season of the measurements, a net photochemical destruction of O3 would be anticipated for the boundary layer region and to altitudes of 2-3 km. At higher altitudes of 7-11 km in the free troposphere, larger mixing ratios and greater variability were usually observed for NO. Both features are

consistent with observed examples of injection of NO and O3 from the lower stratosphere and with the injection of NO from towering, electrically active, cumulonimbus clouds.

Author

A87-33432\* Georgia Inst. of Tech., Atlanta.

FREE TROPOSPHERIC AND BOUNDARY LAYER MEASURE-MENTS OF NO OVER THE CENTRAL AND EASTERN NORTH PACIFIC OCEAN

D. D. DAVIS, J. D. BRADSHAW, M. O. RODGERS, S. T. SANDHOLM, and S. KESHENG (Georgia Institute of Technology, Atlanta). Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 20, 1987, p. 2049-2070. refs (Contract NAG1-50)

Reported in this paper are the Georgia Institute of Technology NO results from the fall 1983 NASA GTE/CITE 1 Airborne Field Sampling Program. These data were predominantly collected over a geographical area defined by the eastern and central North Pacific Ocean, spanning the latitude range of 15-42 deg N. These NO measurements were taken using the two-photon laser-induced fluorescence technique. The data show a general trend of increasing levels of NO from the boundary layer up to altitudes of nearly 10 km. The average midday value of NO at altitudes of less than or equal to 1.8 km was 4 parts per trillion by volume (pptv), and at about 6 km, 20 pptv, whereas that at about 9 km was 25-35 pptv, the higher value reflecting the inclusion of NO data collected from the outflow region of two electrically active cumulonimbus clouds. The high-altitude NO data strongly suggest that at least during the time of the GTE flight operation, the major sources of NO for remote regions of the Pacific Ocean were those resulting from lightning and the downward transport of stratospheric air. Author

**A87-33435\***# National Aeronautics and Space Administration, Washington, D.C.

CARBON MONOXIDE MEASUREMENTS OVER THE EASTERN PACIFIC DURING GTE/CITE 1

ESTELLE P. CONDON, EDWIN F. DANIELSEN (NASA, Ames Research Center, Moffett Field, CA), GLEN W. SACHSE, and GERALD F. HILL (NASA, Langley Research Center, Hampton, VA) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 20, 1987, p. 2095-2102. NASA-supported research refs

As part of the Global Tropospheric Experiment's Chemical Instrumentation Test and Evaluation (GTE/CITE 1) intercomparison, carbon monoxide (CO) measurements were made from the NASA CV-990 aircraft during the fall of 1983 and again in the spring of 1984. The experimental measurements for CO obtained during those flight series over the eastern and mid-Pacific are presented here. Data were acquired from 10 to 20 deg N latitude over the mid-Pacific and from 30 to 37 deg N latitude over the eastern Pacific off the coast of California. A seasonal variation of approximately 34 parts per billion by volume was measured over the altitudes and latitudes sampled, and a small latitudinal variation was also noted. The data are discussed in terms of the meteorological context in which they were collected.

A87-34447

REMOTE-SENSING METHOD FOR DETERMINING MONTHLY PRECIPITATION SUMS USING METEOR-SATELLITE DATA ON THE ATLANTIC OCEAN [DISTANTSIONNYI METOD OTSENKI MESIACHNYKH SUMM OSADKOV PO DANNYM ISZ 'METEOR' NA AKVATORII ATLANTICHESKOGO OKEANA]

A. A. ISAEV and O. N. NASONOVA IN: Aviation and satellite climatology . Moscow, Gidrometeoizdat, 1986, p. 50-54. In Russian.

The possibility of determining monthly precipitation sums under open-ocean conditions on the basis of Meteor-satellite cloud-cover data is examined for the example of the North Atlantic. Detailed multiyear maps of cloud cover, precipitation indices, and precipitation were compiled along with precipitation maps for individual years during 1975-1978 and 1980-1981 for October for the North Atlantic. The results obtained indicate that reliable

estimates of precipitation can be obtained from satellite data for regions where an observation network is absent.

B.J.

### A87-35148#

# SEA SURFACE TEMPERATURE MEASUREMENT FROM SPACE ALLOWING FOR THE EFFECT OF THE STRATOSPHERIC AEROSOLS

T. TAKASHIMA and Y. TAKAYAMA (Meteorological Research Institute, Tsukuba, Japan) Papers in Meteorology and Geophysics (ISSN 0031-126X), vol. 37, Sept. 1986, p. 193-204. refs

A method of deriving the sea surface temperature (SST) from space is described by using the infrared channels of NOAA-AVHRR radiometer with reference to a model atmosphere-ocean system. It was found that, when free of stratospheric aerosols, the combined use of channels 3 (3.7 microns), 4 (11 microns) and 5 (12 microns) is effective for the SST derivation for a moderate amount of precipitable water. However, in the case of a large amount of water vapor, its vertical profile has to be simultaneously determined to correct for the water vapor effect. Furthermore, to evaluate the effect of the stratospheric aerosols on SST, the visible channels are also utilized for the atmosphere correction where the radiation from the atmosphere is affected more by the presence of stratospheric aerosols.

#### A87-35314

### DETERMINATION OF THE VELOCITY OF OCEAN GYRES THROUGH SYNTHETIC APERTURE RADAR

N. K. VYAS and H. I. ANDHARIA (Indian Space Research Organisation, Space Applications Centre, Ahmedabad, India) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 243-249. refs

The simple optical image undergoes blurring due to target motion, but the more complex aperture synthesis process of the Synthetic Aperture Radar (SAR) results in a shift in the position of the moving target. The different parts of an extended nonlinear target (such as an ocean eddy) are differentially shifted in the image plane and this leads to a geometric distortion of the shape of the target. In this paper, an attempt is made to analyze this distortion factor for the case of an ocean gyre and to express it as a function of the velocity of the gyre. The relationship thus arrived at has been applied to the innermost ring of an Atlantic Ocean gyre image by Shuttle Imaging Radar A. The velocity values (speed and direction) are retrieved under the assumption that the target ocean ring is circular in nature. The method appears promising for deriving the velocity field of the ocean gyres through SAR observations from remote platforms. Simultaneous optical observations, if available, will allow the estimation of velocity for ocean gyres/eddies with arbitrary shapes, without the necessity of assuming circularity.

### A87-35315

### LANDSAT IMAGE ENHANCEMENT STUDY OF POSSIBLE SUBMERGED SAND-DUNES IN THE ARABIAN GULF

KHATTAB G. AL-HINAI, JOHN MCMAHON MOORE, and PETER R. BUSH (Imperial College of Science and Technology, London, England) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 251-258. Research sponsored by the University of Petroleum and Minerals (Saudi Arabia). refs

Digital image enhancement of selected Landsat Multispectral Scanner (MSS) image data for the coastal area of eastern Saudi Arabia reveals large sandbanks in relatively clear water, 8-10 m deep. The Landsat MSS imagery of wave length range 0.5-0.6 microns was masked digitally to remove onshore spectral data, and the contrast range of sea areas enhanced to display tonal variations which correspond in form to major barchanoid-shaped shoals on the sea floor. The shape, scale and orientation of the sandbanks suggest that they may be submerged aeolian dunes. If these sandbanks are submerged dunes, they predate the last eustatic sea level rise (8000-10,000 years BP) and must have been stabilized by cementation prior to submergence in order to survive palaeowind and current erosive action.

#### A87-35515

THE DEPENDENCE OF SEA-SURFACE MICROWAVE EMISSION ON WIND SPEED, FREQUENCY, INCIDENCE ANGLE, AND POLARIZATION OVER THE FREQUENCY RANGE FROM 1 TO 40 GHZ

YASUNORI SASAKI, ICHIO ASANUMA, KEI MUNEYAMA, GENICHI NAITO, and TSUTOMU SUZUKI (Japan Marine Science and Technology Center, Yokosuka) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 138-146. refs

#### A87-35516

### SEASONAL AND REGIONAL VARIATIONS OF ACTIVE/PASSIVE MICROWAVE SIGNATURES OF SEA ICE

CHARLES E. LIVINGSTONE, A. LAURENCE GRAY (Canada Centre for Remote Sensing, Ottawa), and KESHAVA P. SINGH (Banaras Hindu University, Varanasi, India) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 159-173. refs

Ku-band (13.3 GHz) scatterometer and K-band (19.4 GHz) radiometer data acquired by the CCRS CV-580 aircraft over the period from 1979 to 1982 in Canadian and Danish (Greenland) coastal waters have been analyzed to determine the seasonal and regional variations of microwave sea-ice signatures. A clustering analysis of the like and cross-polarized scattering cross sections and the H polarized emissivity has been used to identify distinct microwave sea-ice signatures for each ice type and to trace the evolution of these signatures with region and season. Ice-type signatures in the high Arctic under cold conditions are quite stable, and major ice classes are readily identified from microwave measurements. Under warmer conditions the signatures change with the structure, moisture content of the snow pack, and with the free water in the surface layers of the underlying ice.

#### A87-35517

### MICROWAVE SEA-ICE SIGNATURES NEAR THE ONSET OF

CHARLES E. LIVINGSTONE, A. LAURENCE GRAY, KESHAVA P. SINGH (Canada Centre for Remote Sensing, Ottawa), R. G. ONSTOTT (Kansas, University, Lawrence), and L. D. ARSENAULT (Cold Regions Remote Sensing, Stittsville, Canada) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 174-187. refs

On June 22, 1982, the Canada Centre for Remote Sensing's Convair 580 aircraft (CCRS CV-580) made X-band SAR, Ku-band scatterometer, and K-band radiometer measurements of the sea ice in Crozier Channel. Measurements of the physical properties of the ice and snow cover were in progress at a site in the southern portion of the CV-580 measurement area at the time of overflight. The CV-580 X-band SAR and Ku-band scatterometer were cross calibrated with the University of Kansas Heloscat to examine the frequency dependence of surface signatures. Analysis of the combined airborne and surface characterization data set shows that the microwave signatures of the surface, under the conditions present, were dominated by the snow cover and, in bare ice areas, by surface moisture. At frequencies above 9.35 GHz no scattering cross section/brightness temperature signatures could be uniquely related to ice type over the entire experiment area.

### A87-35873

### RAPID ANALYSIS OF SATELLITE RADAR IMAGES OF SEA ICE [OB EKSPRESS-ANALIZE KOSMICHESKIKH RADIOLOKAT-SIONNYKH IZOBRAZHENII MORSKIKH L'DOV]

V. S. KRASIUK, M. NAZIROV, P. A. NIKITIN, and E. V. BUKHMAN (Gosudarstvennyi Nauchno-Issledovatel'skii Tsentr Izucheniia Prirodnykh Resursov, Moscow, USSR) Meteorologiia i Gidrologiia (ISSN 0130-2906), Feb. 1987, p. 70-75. In Russian. refs

Cosmos-1500 radar images of drifting Ross Sea ice are used to evaluate procedures and possibilities for the digital processing of incoming satellite information. Consideration is given to contour superposition, masking, tonal segmentation, and spatial

differentiation. It is concluded that the use of interactive processing techniques for the rapid analysis of images leads to greater reliability and clarity of the results.

#### A87-36101

# USE OF SATELLITE ALTIMETRY FOR OCEAN MONITORING [ISPOL'ZOVANIE SPUTNIKOVOI VYSOTOMETRII V ZADACHAKH KONTROLIA ZA SOSTOIANIEM OKEANA]

V. L. DOROFEEV, I. E. TIMCHENKO, and A. B. FEDOTOV (AN USSR, Morskoi Gidrofizicheskii Institut, Sevastopol, Ukrainian SSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 3-10. In Russian. refs

The use of satellite altimetry data on sea-level variations in numerical dynamic stochastic models of the ocean state is demonstrated. The effect of altimeter measurement errors on the sea-level retrieval accuracy was determined using a quasi-geostrophic model of synoptic variations in world-ocean conditions. The approaches described are applicable for the satellite monitoring of the sea-level conditions and ocean curents.

#### A87-36107

# MEASUREMENT OF THE SPATIAL SPECTRUM OF OCEAN WAVES USING A TWO-FREQUENCY SCATTEROMETER [K OPREDELENIIU PROSTRANSTVENNOGO SPEKTRA VOLN S POMOSHCH'IU DVUKHCHASTOTNOGO SKATTEROMETRA]

M. G. BULATOV, M. D. RAEV, E. I. SKVORTSOV, and V. S. ETKIN (AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) — Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 72-76. In Russian. refs

A two-frequency scatterometer (TFS) aboard an aircraft was used to determine the spatial spectrum of waves on the surface of the Black Sea. A TFS scheme with temporal separation of sounding and reception signals was tested. The method was found to permit measurements of the spectral characteristics of sea waves several meters long. The assessment of the experimentally derived spectral shapes agreed well with the spectral theory of wind waves.

### A87-36945

# AIRCRAFT RADIOPOSITIONING FOR AIRBORNE PHOTOGRAPHY DURING HYDROGRAPHIC COASTAL SURVEYS

J. M. CHIMOT and M. LE GOUIC (Service Hydrographique et Oceanographique de la Marine, Brest, France) Societe Française de Photogrammetrie et de Teledetection, Bulletin (ISSN 0244-6014), no. 103, 1986, p. 11-23. In French.

Results are reported from the development of radiopositioning techniques during two coastal hydrographic surveys of the Bay of Lannion using airborne photography. The overflight times were limited low tide of a calm sea with the sun in a clear sky was at least 30 deg over the horizon to ensure that bottom features were visible. The aircraft was flown at a constant altitude ASL while an on-board interrogator acquired positioning data from two, three or four TRIDENT III beacons in the vicinity of the Bay. Signal acquisition was electronically synchronized with photographic exposures and an on-board timing clock. Distances to the beacons were derived on the basis of the time between broadcast of the interrogation signal and the reception of the reply. Techniques used to reduce biases in the resulting position data are described.

### A87-37056

### PRELIMINARY REPORT ON THE DEVELOPMENT OF MARINE GEOGRAPHIC INFORMATION SYSTEMS

JOAN C. HOCK (NOAA, National Environmental Satellite, Data and Information Service, Washington, DC) ITC Journal (ISSN 0303-2434), no. 2, 1986, p. 156-163.

In combination with conventional in situ data gathering, NOAA scientists are using various satellite data sources in an attempt to create marine geographic information systems which could be of great assistance in - among other things monitoring and controlling coastal pollution and in exploiting fishery resources. Unlike

conventional geo-information systems dealing with relatively permanent topographic features, a marine system must accommodate the dynamic marine environment. The following is a preliminary report on progress to date in three test areas. Author

A87-37563\* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.

### RECURRING POLYNYAS OVER THE COSMONAUT SEA AND THE MAUD RISE

J. C. COMISO (NASA, Goddard Spaceflight Center, Greenbelt, MD) and A. L. GORDON (Lamont-Doherty Geological Observatory, Palisades, NY) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, March 15, 1987, p. 2819-2833. NASA-supported research. refs (Contract NSF DPP-85-02386)

Two remarkable deep ocean polynyas observed in the Antarctic region during the winter of 1980, here referred to as the Cosmonaut polynya and the Maud Rise polynya, are discussed. It is proposed that both polynyas are products of deep-reaching convection which introduces warmer deep water into the surface layer. Hydrographic data at both sites indicate the existence of localized doming of the pycnocline. This brings warmer, saltier deep water close to the sea surface, which has been demonstrated to be an effective preconditioner for deep-reaching convection. A possible relationship between the two polynyas is sugggested in that both are in the eastern margins of the Weddell Sea.

### A87-37564

### LONG WAVES IN THE EQUATORIAL ATLANTIC OCEAN DURING 1983

RICHARD LEGECKIS (NOAA, National Environmental Satellite, Data, and Information Service, Washington, DC) and GILLES REVERDIN (CNRS, Paris, France) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, March 15, 1987, p. 2835-2842. CNRS-supported research. refs

The undulations of the sea surface temperature (SST) front during June and July of 1983 are described, and the wave speed, length, and amplitude are estimated based on these observations. The trajectories of several FOCAL buoys are shown to be influenced by the position of the SST front. An attempt is made to resolve the 0.8 C bias found between the NESDIS operational global 100 km SST maps and the FOCAL drifting buoy measurements at 2 m as described by Reverdin et al. (1984). The SST measured by the buoys is compared to the raw satellite data using two advanced very high resolution radiometer (AVHRR) window channels to correct for atmospheric moisture absorption in cloud-free areas. It is demonstrated that there is a dependence of the satellite SST on the satellite zenith angle, and there is a small day-night bias in the satellite data.

### A87-37565

### COMPARISON OF SATELLITE-DERIVED SEA SURFACE TEMPERATURES WITH IN SITU SKIN MEASUREMENTS

P. SCHLUESSEL (Kiel, Universitaet, West Germany), H.-Y. SHIN, W. J. EMERY (British Columbia, University, Vancouver, Canada), and H. GRASSL (Forschungzentrum Geesthacht, West Germany) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, March 15, 1987, p. 2859-2874. Research supported by the British Columbia Science Council, DFG, and NSERC. refs

Sea surface temperatures (SST) computed from sensor systems on the NOAA polar-orbiting sateilites are compared with surface skin temperatures and subsurface temperature measurements. The importance of scan angle correction to define the correct atmospheric path is discussed, and the improvement of SST retrievals using sensor combination is demonstrated with satellite versus ship skin temperature mean differences ranging from 0.55 to 0.73 C for the advanced very high resolution radiometer (AVHRR) alone, from 0.39 to 0.71 C for AVHRR plus the TIROS operational vertical sounder (TOVS), and from 0.22 to 0.33 C for AVHRR plus high resolution infrared sounder (HIRS). The inproved accuracy for AVHRR plus HIRS is due to additional correction for

the atmospheric water vapor and temperature structures made possible with some of the HIRS channels.

#### A87-37886

### SATELLITE MEASUREMENTS OF SEA SURFACE COOLING DURING HURRICANE GLORIA

PETER CORNILLON (Rhode Island, University, Kingston), LOTHAR STRAMMA (Kiel, Universitaet, West Germany), and JAMES F. PRICE (Woods Hole Oceanographic Institution, MA) Nature (ISSN 0028-0836), vol. 326, March 26, 1987, p. 373-375. refs (Contract N00014-81-C-0062; N00014-84-C-0134)

Satellite-derived infrared images of the western North Atlantic are used here to study sea surface cooling (SSC) caused by hurricane Gloria (1985). Significant regional variations in SSC are well correlated with hydrographic conditions. The greatest cooling occurred in slope waters north of the Gulf Stream where the seasonal thermocline is shallowest and most compressed. Moderate cooling occurred in the open Sargasso Sea where the thermocline is deeper and more diffused. Little or no cooling occurred in shallow coastal waters which were isothermal before the passage of the nurricane. There is a pronounced right-side asymmetry of SSC with stronger and more extensive cooling found on the right side of the hurricane track. These qualitative results are consistent with the notion that vertical mixing within the upper ocean is the dominant SSC mechanism of hurricanes. C.D.

### A87-38826\* Johns Hopkins Univ., Laurel, Md.

### MEASURING OCEAN WAVES FROM SPACE; PROCEEDINGS OF THE SYMPOSIUM, JOHNS HOPKINS UNIVERSITY, LAUREL, MD, APR. 15-17, 1986

ROBERT C. BEAL, ED. (Johns Hopkins University, Laurel, MD) Symposium sponsored by NASA, U.S. Navy, and Johns Hopkins University. Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, 165 p. For individual items see A87-38827 to A87-38848.

Papers are presented on ocean-wave prediction; the quasi-universal form of the spectra of wind-generated gravity waves at different stages of their development; the limitations of the spectral measurements and observations of the group structure of surface waves; the effect of swell on the growth of wind wave; operational wave forecasting; ocean-wave models, and seakeeping using directional wave spectra. Consideration is given to microwave measurements of the ocean-wave directional spectra; SIR research; estimating wave energy spectra from SAR imagery, with the radar ocean-wave spectrometer, and SIR-B; the wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar; and SIR-B ocean-wave enhancement with fast-Fourier transform techniques. Topics discussed include wave-current interaction; the design and applicability of Spectrasat; the need for a global wave monitoring system; the age and source of ocean swell observed in Hurricane Josephine; and the use of satellite technology for insulin treatment

### A87-38831

### THE PRESENT STATUS OF OPERATIONAL WAVE FORECASTING

VINCENT J. CARDONE (Ocean-Weather, Inc., Cos Cob, CT) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 24-32. refs

The basic structure and behavior of first- and second-generation waves models, in particular their propagation schemes and source terms, are examined. The capabilities of operational wave-prediction models for storm hindcasting, wave climate assessment, and real-time applications are evaluated. The development of third-generation models based on improved representations of physical processes of wave growth, wave-wave interactions, and wave dissipation is described, and the benefits to be provided by the third-generation models to wave forecasting are discussed.

#### A87-38832

### THE OPERATIONAL PERFORMANCE OF THE FLEET NUMERICAL OCEANOGRAPHY CENTER GLOBAL SPECTRAL OCEAN-WAVE MODEL

LIANA F. ZAMBRESKY (European Centre for Medium Range Weather Forecasting, Reading, England) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 33-36. refs

An operational 72-hour global wave forecast was made at the Fleet Numerical Oceanography Center, but because of the inaccuracy and scarceness of suitable wave observations, the wave forecast remains uninitialized by any observations. Present model performance is given in order to learn what degree of improvement might be expected should directional wave spectral observations from satellites become available.

### A87-38833

### RECENT RESULTS WITH A THIRD-GENERATION OCEAN-WAVE MODEL

GERBRAND J. KOMEN (Koninklijk Nederland Meteorologisch Institut, DeBilt, Netherlands) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 37-41. refs (Contract NATO-27-0523/85)

The applicability of third-generation ocean-wave models is evaluated using the CRAY computer at the European Centre for Medium Range Weather Forecasting. A prototype model was tested for a global run, a regional hindcast of extratropical storms, and regional hindcast of hurricanes. The test results are compared with observational data and good correlation is observed. The use of satellite wave observations for model validation and data assimilation is examined.

#### A87-38835

### SOME APPROACHES FOR COMPARING REMOTE AND IN-SITU ESTIMATES OF DIRECTIONAL WAVE SPECTRA

WILLARD J. PIERSON, JR. (City College, New York) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 48-54. Research supported by the National Data Buoy Center. refs

Radar imaging systems inherently measure different properties of the spectrum than do the more traditional directional wave buoys. Analysis of the present methods of measuring heave acceleration, pitch, and roll on buoys under development by the National Data Buoy Center (NDBC) explains some of the inconsistencies that have been found not only for NDBC buoys but also for other directional wave buoys. The methods used for buoys can be extended to airborne and spaceborne systems in order to compare spectra estimated by the different systems.

Author

#### A87-38836

### THE MICROWAVE MEASUREMENT OF OCEAN-WAVE DIRECTIONAL SPECTRA

WILLIAM J. PLANT (U.S. Navy, Naval Research Laboratory, Washington, DC) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 55-59. refs

Basic principles of six microwave techniques that have been used to measure ocean-wave directional spectra from aircraft are described. Three of these techniques - synthetic aperture radar, the short pulse scanning beam spectrometer, and the two-frequency resonance scanning beam spectrometer - are proposed as possible ways to measure global directional spectra from satellites.

**A87-38839\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE PHYSICAL BASIS FOR ESTIMATING WAVE-ENERGY SPECTRA WITH THE RADAR OCEAN-WAVE SPECTROMETER FREDERICK C. JACKSON (NASA, Goddard Space Flight Center, Greenbelt, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 70-73. refs

The derivation of the reflectivity modulation spectrum of the sea surface for near-nadir-viewing microwave radars using geometrical optics is described. The equations required for the derivation are presented. The derived reflectivity modulation spectrum provides data on the physical basis of the radar ocean-wave spectrometer measurements of ocean-wave directional spectra.

**A87-38840°** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

# WAVE-MEASUREMENT CAPABILITIES OF THE SURFACE CONTOUR RADAR AND THE AIRBORNE OCEANOGRAPHIC LIDAR

EDWARD J. WALSH (NASA, Goddard Space Flight Center, Greenbelt, MD), DAVID W. HANCOCK, III, DONALD E. HINES (NASA, Wallops Flight Center, Wallops Island, VA), ROBERT N. SWIFT, and JOHN F. SCOTT (EG&G Washington Analytical Services Center, Inc., Pocomoke City, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 74-81. refs

The 36-gigahertz surface contour radar and the airborne oceanographic lidar were used in the SIR-B underflight mission off the coast of Chile in October 1984. The two systems and some of their wave-measurement capabilities are described. The surface contour radar can determine the directional wave spectrum and eliminate the 180-degree ambiguity in wave propagation direction that is inherent in some other techniques such as stereophotography and the radar ocean wave spectrometer. The Airborne Oceanographic Lidar can acquire profile data on the waves and produce a spectrum that is close to the nondirectional ocean-wave spectrum for ground tracks parallel to the wave propagation direction.

#### A87-38841

### A PRACTICAL METHODOLOGY FOR ESTIMATING WAVE SPECTRA FROM THE SIR-B

FRANK M. MONALDO (Johns Hopkins University, Laurel, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 82-86. refs

A step-by-step procedure is outlined to convert synthetic aperture radar imagery into estimates of ocean surface-wave spectra. The procedure is based on a linearized version of a model that relates synthetic aperture radar image intensity spectra and wave slope- or height-variance spectra. The outlined procedure is applied to synthetic aperture radar imagery from the Shuttle Imaging Radar mission and is shown to produce spectra that, except in the lowest sea state, are highly correlated with two-dimensional spectra measured independently.

A87-38843\* National Oceanic and Atmospheric Administration, Seattle, Wash.

### THE AGE AND SOURCE OF OCEAN SWELL OBSERVED IN HURRICANE JOSEPHINE

FRANK I. GONZALEZ (NOAA, Pacific Marine Environmental Laboratory, Seattle, WA), BENJAMIN M. HOLT (California Institute of Technology, Jet Propulsion Laboratory, Pasadena), and DAVID G. TILLEY (Johns Hopkins University, Laurel, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 94-99. refs

A simple kinematic model is applied to SIR-B observations in the far field of Hurricane Josephine in order to estimate the swell origin in space and time. The SIR data was obtained on October 12, 1984, and the geometry of the hurricane swell kinematic model is described. Estimates of the wavenumber and wave age and generation regions of the system are graphically presented and examined. The data reveal that the waves of Hurricane Josephine were generated 0-9 hours before the SIR-B overpass.

# A87-38845\* Johns Hopkins Univ., Laurel, Md. SPECTRASAT - A HYBRID ROWS/SAR APPROACH TO MONITOR OCEAN WAYES FROM SPACE

ROBERT C. BEAL (Johns Hopkins University, Laurel, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 107-115. Research supported by the Johns Hopkins University, NASA, and U.S. Navy. refs

Evidence from both Seasat and the Shuttle Imaging Radar indicates that Doppler contamination in synthetic aperture radar (SAR) at the shorter azimuth (along-track) ocean wavelengths can seriously limit the instrument performance. Although the problem is alleviated at low orbital altitudes, it is never completely eliminated, particularly for higher wave slopes. By combining a SAR with a conically scanning altimeter (a radar ocean-wave spectrometer) on a common low-altitude platform, the disadvantages of each tend to be offset by the advantages of the other. Thus, a hybrid combination of the two may be the most practical approach to monitoring ocean waves from space.

**A87-38846\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

### THE RADAR OCEAN-WAVE SPECTROMETER

FREDERICK C. JACKSON (NASA, Goddard Space Flight Center, Greenbelt, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 116-127. refs

The scanning-beam Radar Ocean-Wave Spectrometer (ROWS) technique is described. The derivation of a spectrum for the reflectivity modulation as a function of range is examined. The usefulness of the ROWS technique was initially validated using aircraft data obtained in 1978 with the GSFC Ku-band pulse-compression radar; additional examples of aircraft data which verify the effectiveness of the ROWS technique are presented. The development of a ROWS mode for Spectrasat is discussed. Consideration is given to the incidence angle, twin beam option for cross-section roll-off and wind vector determination, rotation rate, antenna and footprint dimensions, integration time, sphericity effects, and a processor configuration. A design for the ROWS-mode time-domain processor on Spectrasat is proposed. The performance of the system is evaluated, and it is determined that the system performs well.

# A87-38847 SPECTRASAT INSTRUMENT DESIGN USING MAXIMUM HERITAGE

JOHN L. MACARTHUR (Johns Hopkins University, Laurel, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 128-132. Research supported by the Johns Hopkins University.

The design and components of the Spectrasat RA/ROWS/SAR (radar altimeter/radar ocean wave spectrometer/synthetic aperture radar) are described. The C-band power amplifier uses a waveform with a high pulse-repetition-frequency burst in which 102.4 microsec pulses are transmitted at a rate of about 5 kHz; the transmission and reception schemes for the amplifier are illustrated. The basic features of the instrument are discussed. The receiver design is examined; in the altimeter mode, the local oscillator is a chirped pulse that matches the transmitted chirp to implement full-deramp processing and to transform range offset to frequency offset and at the other times, the Ku-band local oscillator is a continuous wave signal to process the off-nadir ROWS returns. The design and functions of the ROWS and SAR processors are considered.

### A87-38848

### A SPECTRASAT SYSTEM DESIGN BASED ON THE GEOSAT EXPERIMENT

CHARLES C. KILGUS and WILLIAM E. FRAIN (Johns Hopkins University, Laurel, MD) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 133-137. Research supported by the Johns Hopkins University.

The design and components of the Spectrasat system which operates in a 275-km altitude, sun-synchronous orbit and simultaneously measures wave spectra at C- and Ku-bands are described. The Spectrasat spacecraft, with a configuration based on Geosat, provides the systems needed to support the radar instrument. The components and functions of the command, telemetry, Doppler, power, attitude control, and velocity control systems are examined. The ground support for Spectrasat is discussed. Spectrasat stores data for about 9 hrs and then transmits it to the Johns Hopkins University Applied Physics Laboratory for archiving, processing, and distributing. Consideration is given to the RF, digital, and computer elements of the ground station, and the command, control, and monitor; sensor data record; and real-time data record software packages.

# A87-39176 San Diego State Univ., Calif. REMOTELY-SENSED TRACERS FOR HYDRODYNAMIC SURFACE FLOW ESTIMATION

D. A. STOW (San Diego State University, CA) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 261-278. Research supported by the University of California and NASA. refs

Research results concerning tracers useful for estimating hydrodynamic surface flow are reported. Tracer characteristics analyzed include spectral signatures, mapping transformations, sensor penetration depths, conservativeness and horizontal variability. Fluorescent dye is limited in usefulness to small area Lagrangean drift estimates. Suspended sediments and salinity are limited to single-date descriptive and Lagrangean drift estimates for estuarine and adjacent coastal waters. Chlorophyll pigments and surface temperature are the most ubiquitous properties and hold the most potential to be useful tracers. This is particularly the case for coarse- to meso-scale circulation of coastal ocean waters. Potential drawbacks of chlorophyll and surface temperatures as tracers must be overcome prior to their successful application for flow estimations by: (1) compensating for nonconservative sources/sinks; (2) achieving imaging precision sufficient to resolve tracer levels at smaller space scale, and (3) acquiring the ability to remove spatially inhomogeneous atmospheric effects. Author

#### A87-39178

### A TWO-LOOK TECHNIQUE FOR STUDYING ATMOSPHERIC EFFECTS IN OPTICAL SCANNER DATA FOR THE OCEAN

G. KHOSRAVIANI and A. P. CRACKNELL (Dundee, University, Scotland) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 291-308. refs

The traditional method for validating calculated values of chlorophyll concentration in the sea is based on comparisons with in situ point measurements made from ships. An alternative approach based on a two-look method involving data from successive orbits of the Nimbus-7 satellite is presented. The results of some calculations, based on the use of Coastal Zone Color Scanner data, for the Irish Sea viewed from two successive orbits of the Nimbus-7 satellite are presented. The method used involves a first attempt at a self-consistent approach to calculating the aerosol path radiance. Results are presented for two pairs of scenes from Apr. 6, 1980 and May 4, 1980.

#### A87-39179

# THE EFFECT OF A NON-GAUSSIAN POINT TARGET RESPONSE FUNCTION ON RADAR ALTIMETER RETURNS FROM THE SEA SURFACE

P. G. CHALLENOR, M. A. SROKOSZ (Institute of Oceanographic Sciences, Wormley, England), and B. GRECO (European Space Research Institute, Frascati, Italy) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 309-313. refs

In order to derive nonlinear wave parameters from radar altimeter data it is necessary to model the return from the sea surface. Most models assume a Gaussian point target response for the radar, whereas in practice it was found for the Seasat altimeter that the response was non-Gaussian. The effect of a non-Gaussian point target response on the retrieval of nonlinear wave parameters is examined here, using a model based on a Gram- Charlier series. It is found that if the transmitted pulse width is sufficiently small then a non-Gaussian point target response has little effect on the retrieval of nonlinear wave parameters.

Author

# A87-39180\* Naval Research Lab., Washington, D.C. AIRBORNE MICROWAVE DOPPLER MEASUREMENTS OF OCEAN WAVE DIRECTIONAL SPECTRA

W. J. PLANT, W. C. KELLER, A. B. REEVES, E. A. ULIANA (U.S. Navy, Naval Research Laboratory, Washington, DC), and J. W. JOHNSON (NASA, Langley Research Center, Hampton, VA) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 315-330. refs

A technique is presented for measuring ocean wave directional spectra from aircraft using microwave Doppler radar. The technique involves backscattering coherent microwave radiation from a patch of sea surface which is small compared to dominant ocean wavelengths in the antenna look direction, and large compared to these lengths in the perpendicular (azimuthal) direction. The mean Doppler shift of the return signal measured over short time intervals is proportional to the mean sea surface velocity of the illuminated patch. Variable sea surface velocities induced by wave motion therefore produce time-varying Doppler shifts in the received signal. The large azimuthal dimension of the patch implies that these variations must be produced by surface waves traveling near the horizontal antenna look direction thus allowing determination of the direction of wave travel. Linear wave theory is used to convert the measured velocities into ocean wave spectral densities. Spectra measured simultaneously with this technique and two laser profilometers, and nearly simultaneous with this technique and two laser profilometers, and nearly simultaneous with a surface buoy, are presented. Applications and limitations of this airborne Doppler technique are discussed. Author **A87-39462\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TWO-COLOR SHORT-PULSE LASER ALTIMETER MEASURE-MENTS OF OCEAN SURFACE BACKSCATTER

JAMES B. ABSHIRE and JAN F. MCGARRY (NASA, Goddard Space Flight Center, Greenbelt, MD) Applied Optics (ISSN 0003-6935), vol. 26, April 1, 1987, p. 1304-1311. refs

The timing and correlation properties of pulsed laser backscatter from the ocean surface have been measured with a two-color short-pulse laser altimeter. The Nd:YAG laser transmitted 70- and 35-ps wide pulses simultaneously at 532 and 355 nm at nadir, and the time-resolved returns were recorded by a receiver with 800-ps response time. The time-resolved backscatter measured at both 330-m and 1291-m altitudes showed little pulse broadening due to the submeter laser spot size. The differential delay of the 355-nm and 532-nm backscattered waveforms were measured with a rms error of about 75 ps. The change in aircraft altitudes also permitted the change in atmospheric pressure to be estimated by using the two-color technique.

**A87-40250\*** National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York, N.Y.

REGIONAL AND SEASONAL VARIATIONS OF SURFACE REFLECTANCE FROM SATELLITE OBSERVATIONS AT 0.6 MICRON

ELAINE MATTHEWS and WILLIAM B. ROSSOW (NASA, Goddard Institute for Space Studies, New York) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 26, Jan. 1987, p. 170-202. refs

A global series of seasonal visible surface reflectance maps derived from NOAA-5 Scanning Radiometer observations is presented. Methods for isolating clear-sky observations from satellite data are evaluated and the magnitude of atmospheric effects (Rayleigh scattering and ozone absorption) are presented. A preliminary analysis of digital vegetation and soils data bases, which were analyzed in conjunction with the satellite observations, is discussed. Regional and global reflectance homogeneity of land-cover types, and snow brightening for types, are presented. Results demonstrate that the statistical approach for isolating clear-sky radiances used in this study obtains accurate enough values for each location to allow meaningful measurements of seasonal, spatial and ecosystem variations in surface reflectance.

### A87-40281

### THE GEOSAT ALTIMETER MISSION - A MILESTONE IN SATELLITE OCEANOGRAPHY

ROBERT CHENEY, BRUCE DOUGLAS, RUSSELL AGREEN, LAURY MILLER, DENNIS MILBERT (NOAA, National Ocean Service, Rockville, MD) et al. EOS (ISSN 0096-3941), vol. 67, Dec. 2, 1986, p. 1354, 1355. refs

The operation of the U.S. Navy Geosat oceanographic altimeter is described, and some principal results are summarized. During the first 18 months of operation after its launch to a 108-deg-inclination orbit in April 1985, Geosat collected 270 million 2-cm-accuracy sea-level observations (including about 35 million crossovers) along 200 million km of ocean. A primary aim is the construction of long time series of sea-level observations over the tropical Pacific. Sample data are presented in graphs and briefly characterized.

**A87-40289\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

FEEDBACK BETWEEN ICE FLOW, BAROTROPIC FLOW, AND BAROCLINIC FLOW IN THE PRESENCE OF BOTTOM TOPOGRAPHY

SIRPA HAKKINEN (NASA, Goddard Space Flight Center, Greenbelt, MD) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, April 15, 1987, p. 3807-3820. refs

Coupling between externally driven barotropic flow and locally driven baroclinic flow in the presence of an ice cover and topography is studied. The topography is a necessary ingredient in this coupling. This study shows that the observed mesoscale

activity of the ice edge seen in satellite imagery does not necessarily reflect the mesoscale baroclinic activity in the ocean. Besides oceanic eddies, the ice cover can trace the topographic changes via the coupling to the barotropic flow. A two-layer ocean model coupled to an ice model is constructed to simulate an ice-ocean system with a varying bottom topography. In the absence of wind, forcing the ice cover reflects the externally driven barotropic ocean response, especially topographically forced Taylor columns by forming ice streamers or meanders. Some of these features propagate (advected with the ocean currents) as a whole downstream, creating an image of eddy propagation even though there is no baroclinic structure underneath. When downwelling favorable winds (ice on the left from the wind direction) are turned on, in addition to this background barotropic flow, the Ekman flow in the ocean (toward the open ocean) will enhance the meandering of the ice edge due to the barotropic flow. During upwelling favorable winds, the ice edge stays rather compact, including the case when a strong baroclinic, cyclonic vortex is developing beneath an ice meander supported by the Taylor column in the

#### A87-40432

### ICE-EDGE EDDIES IN THE FRAM STRAIT MARGINAL ICE ZONE

O. M. JOHANNESSEN, J. A. JOHANNESSEN, E. SVENDSEN (Bergen, Universitetet, Norway), R. A. SHUCHMAN (Michigan, Environmental Research Institute. Ann Arbor), W. J. CAMPBELL (USGS, Tacoma, WA) et al. Science (ISSN 0036-8075), vol. 236, April 24, 1987, p. 427-429. Research supported by the Bergen Universitetet, Norges Teknisk-Naturvitens-Rapelige Forskningsrad, Norges Almenvitenskapelige Forskningsrad, Navy, and USGS. refs

Five prominent ice-edge eddies in Fram Strait on the scale of 30 to 40 kilometers were observed over deep water within 77 deg N to 79 deg N and 5 deg W to 3 deg E. The use of remote sensing, a satellite-tracked buoy, and in situ oceanographic measurements showed the presence of eddies with orbital speeds of 30 to 40 cm per second and lifetimes of at least 20 days. Ice ablation measurements made within one of these ice-ocean eddies indicated that melting, which proceeded at rates of 20 to 40 cm per day, is an important process in determining the ice-edge position. These studies give new insight on the formation, propagation, and dissipation of ice-edge eddies.

### A87-40433

### REMOTE SENSING OF THE FRAM STRAIT MARGINAL ICE ZONE

R. A. SHUCHMAN, B. A. BURNS (Michigan, Environmental Research Institute, Ann Arbor), O. M. JOHANNESSEN (Bergen, Universitetet, Norway), E. G. JOSBERGER, W. J. CAMPBELL (USGS, Tacoma, WA) et al. Science (ISSN 0036-8075), vol. 236, April 24, 1987, p. 429-431. refs

(Contract N00014-81-C-0295; N00014-83-C-0404)

Sequential remote sensing images of the Fram Strait marginal ice zone played a key role in elucidating the complex interactions of the atmosphere, ocean, and sea ice. Analysis of a subset of these images covering a 1-week period provided quantitative data on the mesoscale ice morphology, including ice edge positions, ice concentrations, flow size distribution, and ice kinematics. The analysis showed that, under light to moderate wind conditions, the morphology of the marginal ice zone reflects the underlying ocean circulation. High-resolution radar observations showed the location and size of ocean eddies near the ice edge. Ice kinematics from sequential radar images revealed an ocean eddy beneath the interior pack ice that was verified by in situ oceanographic measurements.

#### A87-40434

### MESOSCALE OCEANOGRAPHIC PROCESSES BENEATH THE ICE OF FRAM STRAIT

T. O. MANLEY, K. L. HUNKINS (Lamont-Doherty Geological Observatory, Palisades, NY), J. Z. VILLANUEVA (Miami, University, FL), J. C. GASCARD, P. F. JEANNIN (Paris VI, Universite, France) et al. Science (ISSN 0036-8075), vol. 236, April 24, 1987, p. 432-434. Sponsorship: Centre National pour l'Exploitation des Oceans. refs

(Contract CNEXO-84/3147; N00014-76-C-0004; N00014-84-C-0132; N00014-83-K-0020; CEC-CLI-083-F; CNRS-981-022)

A major component of the Fram Strait Marginal Ice Zone Experiment was the investigation of air-sea-ice interactions, processes, and circulation patterns found behind the local ice edge and on scales greater than 10 kilometers (mesoscale and large scale). Neutrally buoyant floats, ice-tethered cyclesondes, and helicopter-based measurements were used to obtain uniquely integrated and consistent views of the mesoscale ocean features beneath the ice cover of Fram Strait. Within the vicinity of the Yermak Plateau, three distinct regions of mesoscale motion were observed that coincided with the shallow topography of the plateau, the northward flowing Atlantic water over the western flank of the plateau, and the strong current-shear zone of the East Greenland Polar Front. A subice meander of the front was also observed, which was probably occluded subsequently.

**A87-40648\*** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### REMOTE SENSING AS A RESEARCH TOOL

F. D. CARSEY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) and H. J. ZWALLY (NASA, Goddard Space Flight Center, Greenbelt, MD) IN: The geophysics of sea ice. New York, Plenum Publishing Corp., 1986, p. 1021-1098. refs

The application of aircraft and spacecraft remote sensing techniques to sea ice surveillance is evaluated. The effects of ice in the air-sea-ice system are examined. The measurement principles and characteristics of remote sensing methods for aircraft and spacecraft surveillance of sea ice are described. Consideration is given to ambient visible light, IR, passive microwave, active microwave, and laser altimeter and sonar systems. The applications of these systems to sea ice surveillance are discussed and examples are provided. Particular attention is placed on the use of microwave data and the relation between ice thickness and sea ice interactions. It is noted that spacecraft and aircraft sensing techniques can successfully measure snow cover; ice thickness; ice type; ice concentration; ice velocity field; ocean temperature; surface wind vector field; and air, snow, and ice surface temperatures.

#### A87-40835

### THE PROPAGATION OF SHORT SURFACE WAVES ON LONGER GRAVITY WAVES

M. S. LONGUET-HIGGINS (Cambridge University; Institute of Oceanographic Sciences, Wormley, England) Journal of Fluid Mechanics (ISSN 0022-1120), vol. 177, April 1987, p. 293-306. refs

The theoretical variations in the wavelength and steepness of short gravity waves propagated over the surface of a train of longer gravity waves of finite amplitude may be calculated once the orbital accelerations and surface velocities in the longer waves have been accurately determined. Use is presently made of a fully nonlinear theory indicating that for longer waves, the short wave steepness can be increased at the crests of the longer waves by a factor of order 8, compared with its value at the mean level; by contrast, linear theory gives a factor of less than 2.

#### A87-41068

### MULTILOOK IMAGES OF OCEAN WAVES BY SYNTHETIC APERTURE RADARS

KAZUO OUCHI (King's College, London, England) IEEE Transactions on Antennas and Propagation (ISSN 0018-926X), vol. AP-35, March 1987, p. 313-318. SERC-supported research. refs

A property of multilook processing of synthetic aperture radar (SAR) data is that a time lapse exists between subapertures, so that they contain information about a scattering surface at different times. Reported here is a theoretical study on the images of dynamic ocean waves processed by this technique. It is shown that due to the time lapse the subimages of a moving ocean wave differ in position depending on the look number and the wave phase velocity. Such images cannot be enhanced by the incoherent addition so much as those of stationary surfaces. The difference in image position can be corrected by defocusing the azimuth reference signal by the same amount as for the correction of defocusing induced by the wave motion. Discussions are presented on the correction of image positions and on the effect of defocusing. The property of the time lapse could be applied to estimating not only the phase velocity of ocean waves but also temporal changes in general scattering surfaces.

#### A87-42637

### OCEAN OPTICS VIII; PROCEEDINGS OF THE MEETING, ORLANDO, FL, MAR. 31-APR.2, 1986

MARVIN A. BLIZARD, ED. (U.S. Navy, Office of Naval Research, Arlington, VA) Meeting sponsored by SPIE. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 637), 1986, 379 p. For individual items see A87-42638 to A87-42647.

(SPIE-637)

Papers are presented on ocean optics, a polarized view of the earth from orbital altitude, albedos and glitter patterns of a wind-roughened sea surface, a fractal geometric model of light pulse propagation in a multilayer ocean, and a multiple-wavelength method for filtering cloud shadows from oceanic spectral-irradiance profiles. Topics discussed include the use of the specific beam attenuation coefficient for identification of suspended particulate material; polarization modulation scattering measurements of well-characterized marine plankton; optical particle sizing for hydrodynamics; ocean-optical measurements using acoustooptic filtering; a simple, logarithmic light sensor; and a refractometer for use in oceanography. Consideration is given the optical properties of ice and snow in polar oceans; wind and nadir-angle effects on airborne-lidar water-surface returns; and the use of satellite remote sensing for the measurement of primary production in the ocean. 1 F

### A87-42638

### OPTICAL PROPERTIES OF THE MARINE ATMOSPHERIC BOUNDARY LAYER - AEROSOL PROFILES

K. L. DAVIDSON (U.S. Navy, Naval Postgraduate School, Monterey, CA) and C. W. FAIRALL (Pennsylvania State University, University Park) IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 18-24. Navy-supported research. refs

The distribution of aerosols in the marine boundary layer can be viewed as a dynamic balance of production, transport and removal processes. The balance of these processes can be represented by a simple mixed-layer model. The vertical distribution of aerosols is dominated by turbulent transport. When mixing is dominated by surface shear or cloudtop cooling (as is typical in mid-latitudes), a single 'well-mixed' layer is sufficient to describe the aerosol profile. When scattered cumulus clouds are present (called the 'trade wind' or 'weak cumulus convection' regime), the well-mixed layer is confined to the region below cloud base. In the region above cloudbase and below cloudtops, strong vertical gradients of aerosol concentration may be observed. A simple parameterization of this gradient is presented.

A87-42640\* University of South Florida, St. Petersburg.
THE INTERACTION OF LIGHT WITH PHYTOPLANKTON IN THE MARINE ENVIRONMENT

KENDALL L. CARDER (South Florida, University, St. Petersburg, FL), DONALD J. COLLINS (California Institute of Technology, Jet Propulsion Laboratory, Pasadena), MARY JANE PERRY (Washington, University, Seattle), H. LAWRENCE CLARK (NSF, Washington, DC), JORGE M. MESIAS (Pontificia Universidad Catolica de Chile, Talcahuano) et al. IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 42-55. refs (Contract NAGW-465; N00014-84-C-0111)

In many regions of the ocean, the phytoplankton population dominates both the attenuation and scattering of light. In other regions, non-phytoplankton contributions to the absorption and scattering may change the remote sensing reflectance and thus affect the ability to interpret remotely sensed ocean color. Hence, variations in the composition of both the phytoplankton population and of the non-phytoplankton material in the water can affect the optical properties of the sea. The effects of these contributions to the remote sensing reflectance and the submarine light field are modeled using scattering and absorption measurements of phytoplankton cultures obtained at the Friday Harbor Laboratory of the University of Washington. These measurements are used to develop regional chlorophyll algorithms specific to the summer waters of Puget Sound for the Coastal Zone Color Scanner, Thematic Mapper and future Ocean Color Imager, and their accuracies are compared for high chlorophyll waters with little or no Gelbstoff, but with variable detrital and suspended material.

Author

A87-42641

### WIND AND NADIR ANGLE EFFECTS ON AIRBORNE LIDAR WATER 'SURFACE' RETURNS

GARY C. GUENTHER (NOAA, National Ocean Service, Rockville, MD) IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 277-286. refs

The effects of the wind and nadir angle on airborne lidar water surface returns are investigated. The character of the surface return depends on the ratio of the peak volume backscatter power and the peak interface reflection power; analytic expressions are derived for mean values of these quantities. The functionalities of the volume-to-interface peak power ratio on wind speed and direction, off-nadir beam incidence angle, and water clarity parameters are studied. Depth measurement error magnitudes are calculated for a volume return. It is observed, for off-nadir angles and low wind conditions, that the detection of the volume backscattter as the surface return will cause consistent shoal biases whose magnitudes are significant and depend on the pulse location algorithm. Potential methods for reducing the shoal bias are discussed. An expression for the temporal profile of a volume backscatter return is presented, and a method for estimating the scattering coefficient of water from the airborne data is described. 1F

A87-42642\* Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.

# THE RELATIONSHIP BETWEEN PHYTOPLANKTON CONCENTRATION AND LIGHT ATTENUATION IN OCEAN WATERS

DAVID A. PHINNEY and CHARLES S. YENTSCH (Bigelow Laboratory for Ocean Sciences, West Boothbay Harbor, ME) IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 321-327. refs (Contract NAG6-17; N00014-81-C-0043)

The accuracy of chlorophyll estimates by ocean color algorithms is affected by the variability of particulate attenuation; the presence of dissolved organic matter; and the nonlinear inverse relationship between the attenuation coefficient, K, and chlorophyll. Data collected during the Warm Core Rings Program were used to model the downwelling light field and determine the impact of

these errors. A possible mechanism for the nonlinearity of K and chlorophyll is suggested; namely, that changing substrate from nitrate-nitrogen to ammonium causes enhanced blue absorption by photosynthetic phytoplankton in oligotrophic surface waters.

Author

A87-42643° California Univ., La Jolla.

REMOTE SENSING OF CHLOROPHYLL CONCENTRATIONS IN THE NORTHERN GULF OF MEXICO

CHARLES C. TREES (California, University, La Jolla) and SAYED Z. EL-SAYED (Texas A & M University, College Station) IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 328-334. refs (Contract NAS5-22966)

During a 17 month period (November 1978 - March 1980), phytoplankton pigment concentrations were remotely sensed in the northern Gulf of Mexico using the Coastal Zone Color Scanner (CZCS). A total of 29 CZCS orbits were processed into pigment (chlorophyll a + phaeopigments) images and then geometrically warped to a Mercator projection. A correction factor of 1.67 was applied to the pigment concentrations to correct for the tendency of the standard fluorometric method to underestimate chlorophyll a concentrations. The spatial and temporal distributions of pigment fronts were quite variable during this time series. Constant features observed throughout the pigment imagery were the entrainment of coastal waters offshore. The most extensive entrainments occurred during intrusions of the Loop Current. For the 17 month survey, the mean HPLC-corrected pigment concentration was 3.30 + or - 1.45 mg/cu m.

A87-42644\* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

# A MODEL FOR THE USE OF SATELLITE REMOTE SENSING FOR THE MEASUREMENT OF PRIMARY PRODUCTION IN THE OCEAN

DONALD J. COLLINS, WEI-LIANG YANG (California Institute of Technology, Jet Propulsion Laboratory, Pasadena), DALE A. KIEFER, JANICE BEELER SOOHOO, and CASSON STALLINGS (Southern California, University, Los Angeles) IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 335-348. refs

A model of primary production based upon the responses of phytoplankton to differing light and nutrient fields is described. This model includes the effects on production of variations in surface pigment concentration, the mixed layer depth, and the dependence on the incident solar irradiance. The model has been tested using in situ data provided by the Southern California Bight Studies of Eppley, et al. (1979), the California Cooperative Fisheries Investigations, the Organization of Persistent Upwelling Structures, and other data sets. A synoptic measure of the distribution of surface pigments is derived from the West Coast Chlorophyll and Temperature Time Series. The features and behavior of the model are presented together with the results of the model verification.

Autho

**A87-42645\*** National Oceanic and Atmospheric Administration, Washington, D. C.

# COASTAL ZONE COLOR SCANNER IMAGERY OF PHYTOPLANKTON PIGMENT DISTRIBUTION IN ICELANDIC WATERS

DENNIS K. CLARK (NOAA, National Environmental Satellite, Data, and Information Service, Washington, DC) and NANCY G. MAYNARD (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; California, University, La IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 350-357. Navy-supported research.

**A87-42646\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SUNLIGHT INDUCED 685 NM FLUORESCENCE IMAGERY

HONGSUK H. KIM (NASA, Goddard Space Flight Center, Greenbelt, MD) and HEINZ VAN DER PIEPEN (DFVLR, Wessling, West Germany) IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 358-363. refs

The capability of a new fluorescence method is evaluated using data from an aircraft fluorescence experiment conducted on the Elbe River on August 10-14, 1981. The technique measures chlorophyll concentrations by monitoring sunlight-induced fluorescence at 685 nm. Upwelling radiance spectra and vertical profiles of upwelling radiances are presented and analyzed. The image-processing algorithm used to retrieve fluorescence signals from raw data is described.

### N87-20635# Meteorological Office, Bracknell (England). OCEAN-ICE PANEL REPORT

T. D. ALLAN and A. MOREL *In* ESA Proceedings of the European Symposium on Polar platform Opportunities and Instrumentation for Remote-sensing (ESPOIR) p 85-88 Nov. 1986

Avail: NTIS HC A07/MF A01

Ocean/ice objectives, payload, observation strategy, and data management of Columbus are outlined. Ocean/ice objectives for Columbus should provide continuity to routine remote sensing of the global oceans and ice caps, and over European coastal zones; prepare for an operational system following the experimental and/or pre-operational satellite systems planned to be launched over the next 5yr; develop and test techniques and concepts; provide improved scientific, social and economic benefits; and toster international, interagency cooperative programs aimed at the routine monitoring of the environment.

N87-20659# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.

POTENTIAL OF LASER REMOTE SENSING OF OIL BELOW WATER SURFACE

OVE STEINVALL Nov. 1986 19 p

(FOA-C-30435-3.1; ISSN-0347-3708; ETN-87-99441) Avail: NTIS HC A02/MF A01

An airborne pollution-monitoring system with a laser bathymeter to detect the oil and a laser fluoresensor for verification is proposed. It is estimated that such a system can have a depth range of 10 m in coastal waters.

N87-20710 Wisconsin Univ., Madison.

A TECHNIQUE TO ESTIMATE THE OCEAN SURFACE ENERGY FLUX USING VAS MULTISPECTRAL DATA Ph.D. Thesis JOHN JOSEPH BATES 1986 164 p

Avail: Univ. Microfilms Order No. DA8605676

A technique is developed to estimate the ocean surface energy flux from multispectral (visible and infrared) data obtained from the visible and infrared spin scan radiometer atmospheric sounder (VAS) on the geostationary GOES satellite. The technique is designed for application in the tropics. The shortwave flux is estimated by application of a simple physical model to visible data. The longwave flux is calculated using a statistical regression algorithm specifically tailored to model tropical cumulus clouds. In order to estimate the latent heat flux, the bulk parameterization is used with the sea surface temperature (SST), low-level moisture. and low-level wind speed, as inputs. Simulation and in-situ matches are used to estimate the expected errors of the method. The model was tested through its application to a case study using several days of data from November of 1982 and 1983 in the eastern tropical Pacific, in order to examine a large SST signal (the El Nino Southern Oscillation, ENSO). The results showed that almost all features on the individual analyses were significant to the 2 sigma level, but that few significant features remained on the difference fields for latent heat flux and net heat flux.

Dissert. Abstr.

N87-20716# Old Dominion Univ., Norfolk, Va.

CONTINENTAL SHELF PROCESSES AFFECTING THE OCEANOGRAPHY OF THE SOUTH ATLANTIC BIGHT Progress Report, 1 Jun. 1986 - 31 May 1987

L. P. ATKINSON Jan. 1987 52 p

(Contract DE-FG05-85ER-60348)

(DE87-005303; DOE/ER-60348/5) Avail: NTIS HC A04/MF A01

As part of a study of continental shelf processes affecting the oceanography of the South Atlantic Bight, data collected during the Spring 1985 SPREX field experiment was processed and analyzed. The goals of the analyses were to: (1) determine the distribution of temperature, salinity, nutrients, and humid fluorescence such that flow fields and distributions of variables could be related to wind forcing events; (2) determine the time change in nutrient concentration and salinity at selected current meter locations; and (3) evaluate the usefulness of tritium as a fresh water tracer in the nearshore region of the South Atlantic Bight.

## N87-21497# Istituto di Fisica dell'Atmosfera, Rome (Italy). REMOTELY SENSED SEA SURFACE TEMPERATURE FOR THE ALPINE EXPERIMENT (ALPEX)

G. DALU, A. VIOLA, and S. MARULLO In WMO Proceedings of the Conference on the Scientific Results of the Alpine Experiment (ALPEX), Volume 1 p 131-138 Jul. 1986 Sponsored by CNR Avail: NTIS MF A01; print copy available from WMO, Geneva, Switzerland

The methodology behind the algorithms used to retrieve the sea surface temperature from infrared radiometric data was examined with a radiative transfer model that simulates the response of the atmosphere for different temperature and water vapor profiles. Linear algorithms are used to evaluate the sea surface temperature from AVHRR data. Although the results obtained show that a nonlinear algorithm is more accurate, a linear algorithm can give better results if it is optimized for a particular region and season. An improved calibration procedure was used to process the data of the AVHRR-2 radiometer.

N87-21533\*# Wisconsin Univ., Madison. Space Science and Engineering Center.

QUICK LOOK ATLANTIC OCEAN RAIN MAPS FOR GALE Interim Report

DAVID W. MARTIN and BRIAN AUVINE Mar. 1987 32 p. (Contract NAG5-742)

(CONTract NAG5-742) (NASA-CR-180511; NAS 1.26:180511) Avail: NTIS HC A03/MF A01 CSCL 08C

A set of quick look maps of Atlantic Ocean rainfall were made. The maps are based entirely on information extracted from geostationary satellite images. The maps and the process by which they were made are briefly described. The major shortcomings are such a project are pointed out. For convenience the maps are presented in rectangular format. Each map covers one day. Rainfall is contoured in units of millimeters. Rainfall was estimated by the Arkin technique.

N87-21534\*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TIDAL ESTIMATION IN THE ATLANTIC AND INDIAN OCEANS, 3 DEG X 3 DEG SOLUTION

BRAULIO V. SANCHEZ, DESIRAJU B. RAO (National Oceanic and Atmospheric Administration, Rockville, Md.), and STEPHEN D. STEENROD (Applied Research Corp., Landover, Md.) Apr. 1987 21 p

(NASA-TM-87812; REPT-8780163; NAS 1.15:87812) Avail: NTIS HC A02/MF A01 CSCL 08C

An estimation technique was developed to extrapolate tidal amplitudes and phases over entire ocean basins using existing gauge data and the altimetric measurements provided by satellite oceanography. The technique was previously tested. Some results obtained by using a 3 deg by 3 deg grid are presented. The functions used in the interpolation are the eigenfunctions of the velocity (Proudman functions) which are computed numerically from a knowledge of the basin's bottom topography, the horizontal plan

form and the necessary boundary conditions. These functions are characteristic of the particular basin. The gravitational normal modes of the basin are computed as part of the investigation; they are used to obtain the theoretical forced solutions for the tidal constituents. The latter can provide the simulated data for the testing of the method and serve as a guide in choosing the most energetic functions for the interpolation.

N87-21980# Joint Publications Research Service, Arlington, Va. POSSIBILITIES OF USING ARTIFICIAL EARTH SATELLITE DATA FOR COMPUTING HEAT EXCHANGE BETWEEN THE ATMOSPHERE IN **NEWFOUNDLAND** AND **ENERGY-ACTIVE ZONE DURING WINTER** 

D. G. RZHEPLINSKIY and N. N. SHVYRKOV In its USSR Report: Space (JPRS-USP-87-001) p 180-181 19 Feb. 1987 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1986 p 32-41 Avail: NTIS HC A11/MF A01

Maps of the dynamic topography of the ocean surface in the Newfoundland Energy-Active Zone (NEAZ) were plotted on the basis of three oceanographic surveys made during the winter of 1983 to 1984. During the first survey the main flow of the Gulf Stream at 50 degrees longitude was traced in the latitude zone from 38 to 43 deg N. The second survey revealed no significant changes in circulation and temperature distribution in the test range. Observations made during the third survey confirmed the presence of the main forms of circulation in the region. The test range was regionalized on the basis of types of vertical distribution of temperature and salinity for determining the limits of propagation of different water structures. Three types of vertical structures were defined: structure of slope waters, structure of transformation zone, and vertical North Atlantic structure. It was found that the intensity of the heat flows between the ocean and atmosphere in the NEAZ in winter is dependent largely on the position of the hydrological front separating the North Atlantic central water mass from the remaining water structures and on the specific meteorological synoptic situation.

N87-22297# Woods Hole Oceanographic Institution, Mass. CHART: A COMPUTER PLOTTING PACKAGE FOR THE DISPLAY OF POSITION-DEPENDENT MARINE DATA A. MARTIN Dec. 1986 57 p Sponsored by Sandia National

(PB87-148607; WHOI-86-43) Avail: NTIS HC A04/MF A01 CSCL 08B

The computer program CHART produces plots of navigation tracks and data points in a choice of 14 projections where navigation coordinates are defined. It was written specifically for the plotting and annotation of geological and geophysical data; however, any data which includes geographical coordinates can be plotted. The package was designed for broad flexibility of application and for ease of use. Chart can be used on any Digitial Equipment Corporation VAX machine running VMS. Some additional features of CHART: coastlines, multiple data sets on one grid; empty grid without data points are given.

N87-22382# Coastal Engineering Research Center, Vicksburg,

**DUCK '85 NEARSHORE WAVES AND CURRENTS EXPERIMENT DATA SUMMARY REPORT Final Report** 

JON M. HUBERTZ, CHARLES E. LONG, PANOLA RIVERS, and WILLIE A. BROWN Feb. 1987 210 p (AD-A177419; CERC-MP-87-3) Avail: NTIS HC A10/MF A01

CSCL 08C

This report provides a summary of mean values of data collected during the nearshore waves and currents experiment which was part of the DUCK '85 field program. The objective of the experiment was to collect data which could be used to study coastal processes and verify numerical models. Data sets such as this provide valuable prototype measurements for validation of theories and techniques which can be used to predict nearshore waves and currents for various climatic conditions.

N87-22386\*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### THE 1982-1983 EL NINO ATLAS: NIMBUS-7 MICROWAVE RADIOMETER DATA

W. TIMOTHY LIU 15 Feb. 1987 77 p. Sponsored by NASA (NASA-CR-180914; JPL-PUB-87-5; NAS 1.26:180914) Avail: NTIS HC A05/MF A01 CSCL 08C

Monthly maps of sea surface temperature, atmospheric water vapor, and surface level wind speed as measured by the Scanning Multichannel Microwave Radiometer (SMMR) on the Nimbus-7 satellite for the tropical Pacific from June 1982 to October 1983, during one of the most intense El Nino Southern Oscillations (ENSO) episodes, are presented. The non-ENSO annual cycle was compiled by averaging the 1980 and 1981 data for each calendar month and was removed from monthly fields of 1982 and 1983 to reveal the anomalous distributions. The anomaly fields and part of the non-ENSO annual cycle are also presented. This study and earlier evaluations demonstrate that the Nimbus/SMMR can be used to monitor large scale and low frequency variabilities in the tropical ocean. The SMMR data support and extend conventional measurements. The variabilities of the three parameters are found to represent various aspects of ENSO related through ocean atmosphere interaction. Their simultaneous and quantitative descriptions pave the way for the derivation of ocean atmosphere latent heat exchange and further the understanding of the coupled atmospheric and oceanic thermodynamics.

Author

N87-22387# Alaska Univ., Fairbanks. Geophysical Inst. STATISTICAL DESCRIPTION OF THE SUMMERTIME ICE EDGE IN THE CHUKCHI SEA, TASK 2 Final Report

W. J. STRINGER and J. E. GROVES Jan. 1987 217 p. (Contract DE-AC21-83MC-20037) (DE87-001056; DOE/MC-20037/2265) Avail: NTIS HC A10/MF

Ice edge data has been analyzed for ice recursion analysis in the Chukchi Sea for a twelve year period. Conclusions drawn include: (1) numerous parameter comparisons describing the great variability of ice extent found in the Chukchi Sea; (2) that for a period of 80 to 100 days beginning with August and continuing through October, ice-free water will exist in the Chukchi Sea south of 70 deg N and 175 deg W. Within these boundaries ice will return (recur) once after it has retreated in the spring, or it will retreat once after it has returned in the fall, less than 50% of the time; (3) ice in the western Chukchi Sea (along the Siberian coast) may provide multi-year ice to the Bering Sea through Bering Strait starting in late fall; (4) melt-back bays (defined by Paquette and Bourke, 1981) created by warm Bering Sea waters channeled by Chukchi Sea bathymetry are persistent and significant features of the Chukchi Sea ice edge. DOF

N87-22388# National Oceanic and Atmospheric Administration, Washington, D. C.

### THE AVHRR/HIRS OPERATIONAL METHOD FOR SATELLITE BASED SEA SURFACE TEMPERATURE DETERMINATION

CHARLES WALTON Mar. 1987 65 p

(NOAA-TR-NESDIS-28) Avail: NTIS HC A04/MF A01

A technique which was used operationally to produce sea surface temperatures from the NOAA polar orbiting satellites between 1976 and 1981 is described. The single window channel technique used before 1976 is described in the NOAA Technical Memorandum NESS 78 while the multiple window channel technique (MCSST) applied since 1981 is well documented. This information bridges the gap between these two periods and provides a continuous record of the evolution of one of NOAA's primary satellite derived meteorological products. Author

N87-23016# Naval Postgraduate School, Monterey, Calif. LASER REFLECTANCE AS A FUNCTION OF ROUGH WATER GLITTER PROFILE M.S. Thesis

CARLTON M. BOURNE Mar. 1987 67 p.

(AD-A178774) Avail: NTIS HC A04/MF A01 CSCL 17H

A new remote sensing technique was developed for predicting the expected mean laser radar return from a rough water surface. This technique involved measuring the standard deviations of the upwind and crosswind profiles of the elliptical glitter patterns occurring for illumination of the water surface with a point source near the laser radar system. A pencil beam laser radar from a companion project simultaneously measured the reflected signals from the water surface. The glitter pattern images were recorded with a video camera and recorder. The images for each run were later digitized along their major and minor elliptic axes and averaged over 256 images to produce smooth intensity curvers from which the standard deviations were measured. The radar return fluctuated over a large range because of the rapid variation of individual water surface facets, and so was recorded and time averaged for the same interval as the video images. Data sufficient for empirical preduction of expected mean laser return signal were obtained. This is necessary to permit evaluation of the performance of a given laser radar design. The data obtained approximated the predictions of a new model proposed in this work.

N87-23046# European Centre for Medium-Range Weather Forecasts, Reading (England).

THE IMPACT OF INITIAL CONDITIONS AND SST ANOMALIES ON EXTENDED RANGE PREDICTIONS FOR THE EL NINO PERIOD

ULRICH CUBASCH In World Climate Program Workshop on Comparison of Simulations by Numerical Models of the Sensitivity of the Atmospheric Circulation to Sea Surface Temperature Anomalies p 110-116 Jul. 1986

Avail: NTIS MF A01; print copy available from WMO, Geneva, Switzerland

The El Nino sea surface temperature (SST) anomaly observed during 1982 to 1983 was used to investigate the impact of anomalous forcing at the lower boundary on the predictability of the atmosphere. In order to test the impact of the SST as a function of the initial conditions, forecasts using the observed or climatological SST adjusted every 5th day, were run starting on December 15, 16, and 17 1982. All experiments were run up to 90 days with the ECMWF spectral model and a resolution of T42L16 (i.e., with a Gaussian grid of 2.8125 deg) from the ECMWF operational 12z analysis. Results show that precipitation can be used as a diagnostic tool for the effect of El Nino on the tropical atmosphere. The difference between the experiments with the observed moving and climatological SST indicates the impact of the El Nino SST anomaly on the atmosphere.

N87-23102# Admiralty Research Establishment, Portland (England).

THE SIR-B MISSION: TOWARDS AN UNDERSTANDING OF INTERNAL WAVES IN THE OCEAN

M. T. BAGG, A. C. EDWARDS, J. R. PERRY, J. C. SCOTT, J. A. STACEY, and J. O. THOMAS Dec. 1986 51 p (Contract MOD(PE)-NUW-72A/1287)

(ARE-TR-86122; ACCN-74513; BR101469; ETN-87-99809) Avail: NTIS HC A04/MF A01

An internal wave sea truch experiment was conducted in conjunction with SIR-B overflights. Using knowledge obtained from sea truth and radar imagery of internal waves computational and theoretical procedures to model observed surface signatures are presented. The procedures are intended to predict the changing wave action spectral density of the ocean surface short wavelength surface gravity waves as they propagate across the straining region induced at the surface by the underlying internal wave. Variants of the Phillips (1984) formulation of the wave action source and sink terms are used to account for the effects of the wind and wave breaking on the development of the wave action spectral density. Considerable success is achieved in understanding how various signatures arise. FSA

N87-23103# Royal Australian Navy Research Lab., Edgecliff. STUDIES OF THE EAST AUSTRALIAN CURRENT OFF NORTHERN NEW SOUTH WALES

P. J. MULHERAN Aug. 1986 73 p (AD-A178461; RANRL-TN-6/86) Avail. NTIS HC A04/MF A01 CSCL 08C

Cruises in November 1982 and May 1983 were conducted to investigate the structure of the front on the near-shore edge of the East Australian Current off northern New South Wales. Concurrent satellite data were also obtained. From this work it was found that the front could move in the east-west direction at speeds of order 10 to 20 km/day, that the surface mixed layer became very shallow near the surface front, and that the front's structure was at times affected by fresh water outflow from the Clarence River. It was also found that LANDSAT Imagery could be useful in frontal investigations and that it is feasible to obtain depth - averaged currents with a geomagnetic electro-kinetograph (GEK). Author (GRA)

N 7-23104# Oregon State Univ., Corvallis. Coll of Oceanography.

OPTICAL DYNAMICS EXPERIMENT (ODEX) DATA REPORT R/V ACANIA EXPEDITION 10 OCTOBER-17 NOVEMBER 1982. **VOLUME 2: PARTICLE SIZE DISTRIBUTIONS. VOLUME 6:** SCALAR SPECTRAL-RADIOMETER DATA

HASONG PAK, DAVID W. MENZIES, and JAMES C. KITCHEN Sep. 1986 408 p

(Contract N00014-84-C-0218)

(AD-A178535; DATA-124-VOL-2/6; REF-86-10-VOL-2/6) Avail: NTIS HC A18/MF A01 CSCL 08J

The Optical Dynamics Experiment (ODEX) was an interdisciplinary experiment to study the relation of physical forcing, biological processes, and the structure of optical parameters in the open ocean. This data report presents the data collected with the spectral radiometer package, and the particle size analysis of discrete water samples taken from CTD casts by the Oregon State Univ. Optical Oceanography Group. The ODEX cruise of Oct. and Nov. 1982 occupied 1984 stations along a transect from the California coast at 35 deg N to a study area covering the subtropical front near 32 deg N, 142 deg W. Plots are presented of hydrographic parameters, beam attenuation, percentage of surface rradiance at 9 wave-lengths, and diffuse attenuation at 5 wavelengths. Lists of the same parameters as well as discrete and total visible irradiance are presented. GRA

N87-24009# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

ACTIVE AND PASSIVE REMOTE SENSING OF ICE Semiannual Report, 1 Aug. 1986 - 31 Jan. 1987 JIN A. KONG 31 Jan. 1987 9 p

(Contract N00014-83-K-0258)

(AD-A179461) Avail: NTIS HC A02/MF A01 CSCL 171

During the period August 1, 1986 to January 31, 1987, we have studied the volume scattering effects of snow-covered sea ice with a three-layer random medium model for microwave remote sensing. The strong fluctuation theory and the bilocal approximation are applied to calculate the effective permittivities for snow and sea ice. The wave scattering theory in conjunction with the distorted Born approximation is then used to compute bistatic coefficients and backscattering cross sections. Theoretical results are illustrated by matching experimental data for dry snow-covered thick first-year sea ice at Point Barrow. The radar backscattering cross sections are seen to increase with snow cover for snow-covered sea ice. due to the increased scattering effects in the snow layer. The results derived can also be applied to the passive remote sensing by calculating the emissivity from the bistatic scattering coefficients. GRA

N87-24012\*# National Marine Fisheries Service, Miami, Fla. Southeast Fisheries Center.

UTILIZING REMOTE SENSING OF THEMATIC MAPPER DATA TO IMPROVE OUR UNDERSTANDING OF ESTUARINE PROCESSES AND THEIR INFLUENCE ON THE PRODUCTIVITY OF ESTUARINE-DEPENDENT FISHERIES Semiannual Progress Report

JOAN A. BROWDER, L. NELSON MAY, JR., ALAN ROSENTHAL, ROBERT H. BAUMANN, and JAMES G. GOSSELINK 10 Jun. 1987 21 p

(Contract NASA ORDER S-56107-D)

(NASA-CR-180984; NAS 1.26:180984; SAPR-4) Avail: NTIS HC A02/MF A01 CSCL 08B

A stochastic spatial computer model addressing coastal resource problems in Lousiana is being refined and validated using thematic mapper (TM) imagery. The TM images of brackish marsh sites were processed and data were tabulated on spatial parameters from TM images of the salt marsh sites. The Fisheries Image Processing Systems (FIPS) was used to analyze the TM scene. Activities were concentrated on improving the structure of the model and developing a structure and methodology for calibrating the model with spatial-pattern data from the TM imagery.

N87-24061# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.

OCEAN WIND AND WAVE MODEL COMPARISONS WITH GEOSAT (GEODESY SATELLITE) SATELLITE DATA Final Report

R. L. PICKETT, D. A. BURNS, and R. D. BROOME Dec. 1986

(AD-A178302; NORDA-168) Avail: NTIS HC A02/MF A01 CSCL 08C

By comparing operational wind and wave models to GEOSAT, we found that on 10 March 1986, the Federal Republic of Germany had the best skill score for a regional wind analysis, NOAA had the best score for a global wind analysis, the Netherlands had the best score for a regional wave analysis and the U.S. Navy had the best score for a global wave analysis.

## N87-24731# Joint Publications Research Service, Arlington, Va. HIGH RESOLUTION SEA SURFACE TEMPERATURE FIELD DERIVED.

SISONG ZHOU, WEIYING CHEN, and LIXIA ZHANG In its China Report: Science and Technology p 48-55 2 May 1986 Transl. into ENGLISH from Haiyang Kexue (Beijing, China), v. 9, no. 3, 9 May 1985 p 5-9

Avail: NTIS HC A05/MF A01

A procedure for deriving high resolution sea surface temperature field from digital AVHRR/HRPT data is described. For the purpose of reducing the processing time, only the reflective threshold or near infrared channel is used for selecting data over clear areas of ocean. The W.L. Smith single window channel sea surface temperature retrieval method is used for atmospheric attenuation correction for the area of Beihai Bay and the Yellow Sea during the cold half of the year. Compared with other measurements, the result is quite satisfactory.

N87-24766# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Systems Group.

ADVANCED IMAGING SPECTROMETER FOR OCEAN COLOR/FLUORESCENCE MEASUREMENTS AND FURTHER APPLICATIONS

B. KUNKEL, F. BLECHINGER, R. LUTZ, and H. WINKENBACH In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 237-246 Nov. 1986

Avail: NTIS HC A99/MF A01

A spaceborne chlorophyll fluorescence imaging spectrometer is proposed. The instrument is suitable also for a variety of other applications, especially as an airborne version. The technical concept is based on an all-reflective optics system and a 1024 sq matrix CCD detector array. The imaging spectrometer is designed to cover a spectral range from 425 to 960 nm in resolution

steps of 5 nm per channel at 0.06 % albedo resolution. It provides 108 spectral channels. The FOV amounts to + or - 16.2 deg at 300 m ground pixel size. This corresponds to 1024 pixels in the spatially scanned (cross track) direction. Since no frame-transfer matrix CCD array with 1024 sq pixels is available, the initiated airborne version uses 512 sq.

N87-24816\*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

RADIAL ORBIT ÉRROR REDUCTION AND SEA SURFACE TOPOGRAPHY DETERMINATION USING SATELLITE ALTIMETRY

THEODOSSIOS ENGELIS Jun. 1987 192 p (Contract NAG5-519)

(NASA-CR-180570; NAS 1.26:180570; REPT-377) Avail: NTIS HC A09/MF A01 CSCL 08C

A method is presented in satellite altimetry that attempts to simultaneously determine the geoid and sea surface topography with minimum wavelengths of about 500 km and to reduce the radial orbit error caused by geopotential errors. The modeling of the radial orbit error is made using the linearized Lagrangian perturbation theory. Secular and second order effects are also included. After a rather extensive validation of the linearized equations, alternative expressions of the radial orbit error are derived. Numerical estimates for the radial orbit error and geoid undulation error are computed using the differences of two geopotential models as potential coefficient errors, for a SEASAT orbit. To provide statistical estimates of the radial distances and the geoid, a covariance propagation is made based on the full geopotential covariance. Accuracy estimates for the SEASAT orbits are given which agree quite well with already published results. Observation equations are develoed using sea surface heights and crossover discrepancies as observables. A minimum variance solution with prior information provides estimates of parameters representing the sea surface topography and corrections to the gravity field that is used for the orbit generation. The simulation results show that the method can be used to effectively reduce the radial orbit error and recover the sea surface topography. Author

N87-24870\* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ARCTIC SÉA ICE, 1973-1976: SATELLITE PASSIVE-MICROWAVE OBSERVATIONS

CLAIRE L. PARKINSON, JOSEFINO C. COMISO, H. JAY ZWALLY, DONALD J. CAVALIERI, PER GLOERSEN, and WILLIAM J. CAMPBELL (Puget Sound Univ., Tacoma, Wash.) Jan. 1987 301 p Original contains color illustrations

(NASA-SP-489; NAS 1.21:489; LC-86-23876) Avail: NTIS HC A14 CSCL 08L

The Arctic region plays a key role in the climate of the earth. The sea ice cover affects the radiative balance of the earth and radically changes the fluxes of heat between the atmosphere and the ocean. The observations of the Arctic made by the Electrically Scanning Microwave Radiometer (ESMR) on board the Nimbus 5 research satellite are summarized for the period 1973 through 1976.

### 06

### HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

### A87-31409

## NIMBUS 7 SMMR IP: VESTIGATION OF SNOWPACK PROPERTIES IN THE NORTHERN GREAT PLAINS FOR THE WINTER OF 1978-1979

MARSHALL J. MCFARLAND (Texas A & M University, College Station), GREGORY D. WILKE (USAF, Global Weather Central, Offutt AFB, NE), and PAUL H. HARDER, II (DBA Systems, Inc., Fairfax, VA) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, Jan. 1987, p. 35-46. refs

An investigation of the capabilities of remote sensing of snowpack properties was conducted with brightness temperatures from the Nimbus 7 Scanning Multichannel Microwave Radiometer (SMMR) and climatological data for the northern Great Plains for the winter of 1978-1979. The radiometer data included horizontally and vertically polarized brightness temperatures at the 0.81-, 1.66-, and 2.80-, and 4.54-cm wavelengths for both day and night overpasses, with a repeat coverage on the average of every two to three days. The brightness temperatures in each channel and the daily surface climatological elements of maximum and minimum air temperature, precipitation, snowfall, and snow depth were objectively analyzed to a 20-km grid with 35 rows and 42 columns. The analysis concentrated on temporal analyses of selected grid cells. Characteristic signatures were observed for initial snow accumulation, snow depth to about 20 cm, beginning of snow melting in the surface layers, and snow melt. The process of snow ripening was evident in the thawing and refreezing cycles of the snow surface layers. Discrimination of dry soil, wet soil, snow amount to 15 cm, and liquid water at the soil surface before runoff occurred was present with the use of both polarizations at the 0.81 and 1.66-cm wavelengths, although the longer wavelengths contained additional information on the state of the surface underlying the snow pack. Author

### A87-32092

### DETERMINING RAINFALL INTENSITY AND TYPE FROM GOES IMAGERY IN THE MIDLATITUDES

A. A. TSONIS (Wisconsin, University, Milwaukee) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, Feb. 1987, p. 29-36, refs

Although a useful estimate of the areal extent of precipitation from visible and infrared satellite data can be made, the extraction of rainfall rates is still a problem. Earlier work by the author suggested that little, if any, correlation exists between rainfall rate and brightness or cloud top temperature individually. The results of this work indicate that by employing pattern matching techniques it may be possible to objectively define a satellite delineated rain area in terms of light-moderate and moderate-heavy. Further, convective and nonconvective precipitation areas can be separated.

### A87-33295

# ON THE RELATIVE ACCURACY OF SATELLITE AND RAINGAGE RAINFALL MEASUREMENTS OVER MIDDLE LATITUDES DURING DAYLIGHT HOURS

A. BELLON and G. L. AUSTIN (McGill Radar Weather Observatory, Sainte-Anne-de-Bellevue, Canada) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 25, Nov. 1986, p. 1712-1724. Research supported by the Canadian Forestry Service and NSERC. refs

Relationships between visible and/or IR data and the rainfall rate were derived by comparing raingage-calibrated radar data with colocated satellite information over Montreal, Canada. The comparison of the satellite estimates for 14 summertime rainfalls

was made with both the point gage measurements and with interpolated gage data. The overall absolute difference of 1739 point comparisons was found to be of the order of 85 percent at the 2-mm rain level. The rates of the rainfall rate were estimated from half-hourly point GOES measurements as a function of either (1) both visible and IR temperatures; (2) the normalized visible-only data; (3) the IR-only temperatures; or (4) the satellite rain area multiplied by a constant rainfall rate. The scores of the visible-IR and visible-only methods were found to be adequate (gamma = 0.56 and 0.50, respectively), but the IR-only method was judged inadequate. The satellite techniques were found to be better than gage-interpolated estimates at locations where the nearest gage was farther than 40 km, and thus to be most useful in the data-sparse regions.

### A87-33297

### AN EVALUATION OF SATELLITE-BASED INSOLATION ESTIMATES FOR OHIO

JOHN C. KLINK and KEVIN J. DOLLHOPF (Miami University, Oxford, OH) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 25, Nov. 1986, p. 1741-1751. refs

The accuracy of the estimates of daily insolation for Ohio produced by the National Environmental Satellite Data and Information Service (NESDIS) from GOES observations in 1982 was assessed through comparison with isolated measurements from eight ground-based stations. For the snow-free season, the mean errors (bias) of the estimates (positive for all days) are generally less than 0.75 MJ/sq m per day, and the correlation coefficients are above 0.95. Estimates are much less accurate when a snow cover existed. Generally, the bias is negative and exceeds -1.25 MJ/sq m per day, and correlation coefficients are less than 0.90.

### A87-35311

### DEVELOPMENT OF A SATELLITE REMOTE SENSING TECHNIQUE FOR THE STUDY OF ALPINE GLACIERS

ANNA DELLA VENTURA, ANNA RAMPINI (CNR, Istituto di Fisica Cosmica e Tecnologie Relative, Milan, Italy), RICCARDO RABAGLIATI (IBM Italia S.p.A., Mestre, Italy), and ROSSANA SERANDREI BARBERO (CNR, Istituto per lo Studio della Dinamica delle Grandi Masse, Venice, Italy) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 203-215. refs

This paper presents an experiment in MSS image interpretation for the systematic observation of glacier surfaces in the Alps. The glacier monitoring potential of visible and near-infrared data is applied here to the surveying of mountain glaciers, characterized by small areas and strong shading because of their typical morphology. The method developed identifies glacier surfaces by evaluating the intensity values of visible images combined with clearness conditions related to exposure, slope and the surface homogeneity of the glacier. Conditions of clarity, in the absence of a digital terrain model, are estimated from the number of saturated pixels in the visible bands. At a higher level, the near-infrared data are used to identify snow and ice surfaces inside the glacier boundaries. The paper discusses the performance of the technique developed, as applied to the analysis of a temporal series concerning a group of 11 small glaciers with critical exposure conditions. The results are expressed as areas of glacier and snow-covered terrain in different years, thus enabling trends in regional mass balance to be estimated. Author

### A87-35518

## THE RELATION OF MILLIMETER-WAVELENGTH BACKSCATTER TO SURFACE SNOW PROPERTIES

LARRY D. WILLIAMS (Edinburgh, University, Scotland) and JOHN G. GALLAGHER (Royal Signals and Radar Establishment, Malvern, England) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 188-194. refs

Helicopter-mounted radar measurements of 94-GHz backscatter from snowcover, and ground-truth measurements of snow surface roughness, wetness, grain size, and porosity, are analyzed. For each of six polarization combinations, and separately for dry snow and wet snow, spatial mean values of the backscatter coefficient

are fit to linear combinations of the cosine of incidence angle and the snow variables. However, the significance of an included snow variable is considered questionable if the predicted response of the spatial mean values of the backscatter coefficient to that variable is small compared with the spatial standard deviation (typically 4-5 dB). This is the case for dry-snow grain size, porosity, and for some polarization combinations, wetness. Only the response to wet-snow surface roughness is consistently comparable in magnitude to the standard deviations of the spatial mean value of the backscatter coefficient.

#### A87-36102

CLOUD-COVER AND PRECIPITATION PATTERNS OVER THE REPUBLIC OF GUINEA ACCORDING TO GROUND-BASED AND SATELLITE OBSERVATIONS [REZHIM OBLACHNOSTI I OSADKOV NA TERRITORII GVINEISKOI RESPUBLIKI PO NAZEMNYM I SPUTNIKOVYM NABLIUDENIIAM]

N. A. TIMOFEEV, A. N. BOLSHAKOV, M. V. IVANCHIK, and A. I. SEVOSTIANOV (AN USSR, Morskoi Gidrofizicheskii Institut, Sevastopol, Ukrainian SSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 11-17. In Russian. refs

### A87-36103

SURFACE MANIFESTATIONS OF HYDROPHYSICAL PROCESSES IN THE STRAIT OF GIBRALTAR ACCORDING TO 'SALYUT-6' PHOTOGRAPHS [POVERKHNOSTNYE PROIAV-LENIIA GIDROFIZICHESKIKH PROTSESSOV V RAIONE GIBRALTARSKOGO PROLIVA PO MATERIALAM FOTOS'EMKI S ORBITAL'NOI STANTSII 'SALIUT-6']

A. S. KAZMIN (AN SSSR, Institut Okeanologii, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 18-23. In Russian. refs

#### A87-36106

SATELLITE TECHNIQUES FOR STUDYING ICE CRUSTS AND UNDERGROUND WATERS IN THE EASTERN PAMIR [KOSMICHESKIE METODY IZUCHENIA NALEDEI I PODZEMNYKH VOD VOSTOCHNOGO PAMIRA]

A. G. TOPCHIEV (Vsesoiuznyi Nauchno-Issledovatel'skii Tsentr AlUS-Agroresursy, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1986, p. 48-58. In Russian. refs

**A87-39467\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MONSOON FLOOD BOUNDARY DELINEATION AND DAMAGE ASSESSMENT USING SPACE BORNE IMAGING RADAR AND LANDSAT DATA

MARC L. IMHOFF, C. VERMILLION (NASA, Goddard Space Flight Center, Greenbelt, MD), M. H. STORY (Science Applications Research Corp., Lanham, MD), A. M. CHOUDHURY, A. GAFOOR (Space Research and Remote Sensing Organization of Bangladesh, Dhaka) et al. Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, April 1987, p. 405-413. refs

Space-borne synthetic aperture radar (SAR) data acquired by the Shuttle Imaging Radar-B (SIR-B) Program and Landsat Multispectral Scanner Subsystem (MSS) Data from Landsat 4 were used to map flood boundaries for the assessment of flood damage in the Peoples Republic of Bangladesh. The cloud penetrating capabilities of the L-band radar provided a clear picture of the hydrologic conditions of the surface during a period of inclement weather at the end of the wet phase of the 1984 monsoon. The radar image data were digitally processed to geometrically rectify the pixel geometry and were filtered to subdue radar image speckle effects. Contrast enhancement techniques and density slicing were used to create discrete land-cover categories corresponding to surface conditions present at the time of the Shuttle overflight. The radar image classification map was digitally registered to a spectral signature classification map of the area derived from Landsat MŠS data collected two weeks prior to the SIR-B mission. Classification accuracy comparisons were made between the radar and MSS classification maps, and flood boundary and flood damage assessment measurements were made with the merged data by adding the classifications and inventorying the land-cover classes inundated at the time of flooding.

A87-40249\* South Dakota School of Mines and Technology, Rapid City.

THE AREA-TIME-INTEGRAL TECHNIQUE TO ESTIMATE CONVECTIVE RAIN VOLUMES OVER AREAS APPLIED TO SATELLITE DATA - A PRELIMINARY INVESTIGATION

ANDRE A. DONEAUD, JAMES R. MILLER, JR., L. RONALD JOHNSON (South Dakota School of Mines and Technology, Rapid City), THOMAS H. VONDER HAAR, and PATRICK LAYBE (Colorado State University, Fort Collins) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 26, Jan. 1987, p. 156-169. refs

(Contract NAG5-386)

The use of the area-time-integral (ATI) technique, based only on satellite data, to estimate convective rain volume over a moving target is examined. The technique is based on the correlation between the radar echo area coverage integrated over the lifetime of the storm and the radar estimated rain volume. The processing of the GOES and radar data collected in 1981 is described. The radar and satellite parameters for six convective clusters from storm events occurring on June 12 and July 2, 1981 are analyzed and compared in terms of time steps and cluster lifetimes. Rain volume is calculated by first using the regression analysis to generate the regression equation used to obtain the ATI; the ATI versus rain volume relation is then employed to compute rain volume. The data reveal that the ATI technique using satellite data is applicable to the calculation of rain volume.

### A87-40308#

### REMOTE SENSING APPLICATIONS IN HYDROLOGY

THOMAS SCHMUGGE (USDA, Hydrology Laboratory, Beltsville, MD) Reviews of Geophysics (ISSN 8755-1209), vol. 25, March 1987, p. 148-152. refs

The physical basis of remote sensing depends on the inference of land-surface characteristics from the measurement of the emitted or reflected EM radiation from the earth. The hydrologically related parameters studied using this approach include: surface temperature, evapotranspiration, soil moisture, precipitation, snow, and components of the radiation balance. Significant progress has been made in determining these quantities using radiation at wavelengths from the microwave to gamma rays. The recent progress in several of these areas is documented in this review.

Author

### A87-40309\* California Univ., Santa Barbara. RECENT RESEARCH IN SNOW HYDROLOGY

JEFF DOZIER (California, University, Santa Barbara) Reviews of Geophysics (ISSN 8755-1209), vol. 25, March 1987, p. 153-161. Research supported by the California Air Resources Board. refs (Contract NAS5-28770)

Recent work on snow-pack energy exchange has involved detailed investigations on snow albedo and attempts to integrate energy-balance calculations over drainage basins. Along with a better understanding of the EM properties of snow, research in remote sensing has become more focused toward estimation of snow-pack properties. In snow metamorphism, analyses of the physical processes must now be coupled to better descriptions of the geometry of the snow microstructure. The dilution method now appears to be the best direct technique for measuring the liquid water content of snow; work on EM methods continues. Increasing attention to the chemistry of the snow pack has come with the general focus on acid precipitation in hydrology. Author

### A87-42256

### INLAND WETLAND CHANGE DETECTION USING AIRCRAFT MSS DATA

JOHN R. JENSEN, ELIJAH W. RAMSEY (South Carolina, University, Columbia), HALKARD E. MACKEY, JR. (DuPont de Nemours Savannah River Laboratory, Aiken, SC), ERIC J. CHRISTENSEN (EG&G Energy Measurements, Las Vegas, NV), and REBECCA R. SHARITZ (Georgia, University, Aiken, SC) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, May 1987, p. 521-529. refs (Contract DE-AC09-76SR-00819; DE-AC09-76SR-00001)

Nontidal wetlands in a portion of the Savannah River swamp forest affected by reactor cooling water discharges were mapped using March 31, 1981 and April 29, 1985 high-resolution aircraft multispectral scanner (MSS) data. Due to the inherent distortion in the aircraft MSS data and the complex spectral characteristics of the wetland vegetation, it was necessary to implement several innovative techniques in the registration and classification of the MSS data of the Pen Branch Delta on each date. In particular, it was necessary to use a piecewise-linear registration process over relatively small regions to perform image-to-image registration. When performing unsupervised classification, an iterative 'cluster busting' technique was used which simplified the cluster labeling process. These procedures allowed important wetland vegetation categories to be identified on each date. The multiple-date classification maps were then evaluated using a post-classification comparison technique yielding estimates of change in the wetland Author classes

N87-22364# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France).

MEASUREMENT AND DETECTION OF PRECIPITATION.

SATELLITE METHODS IN THE VISIBLE AND THE INFRARED
[DETECTION ET MESURE DES PRECIPITATIONS. METHODES

SATELLITAIRES EN VISIBLE ET EN INFRAROUGE]

MICHEL DESBOIS *In its* Energy Balance of the Tropical Systems (BEST). Conference on the Scientific Prospects of the Project p 5-10 1986 In FRENCH

Avail: NTIS HC A11/MF A01

The utilization of combined visible and infrared precipitation measurements is discussed. The application to the study of space-time distribution of large scale rain is reviewed, in particular the phenomena associated with El Nino. It is concluded that there is not a simple universal method that can be applied to any type of cloud, any region, any season. Local measurements are necessary in each case to calibrate the measuring system. ESA

N87-22373# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France).

ENERGY BALANCE OF THE TROPICAL SYSTEMS (BEST): A SPACE EXPERIMENT PROPOSITION [PROJET D'EXPERIENCE SPATIALE 'BEST'. BILAN ENERGETIQUE DU SYSTEME TROPICAL]

P. AMAYENC, R. BERNARD, L. EYMARD, J. TESTUD, D. VIDAL-MADJAR, G. MEGIE, J. PELON, J. P. JEGOU, J. BARAT, P. FLAMANT (Ecole Polytechnique, Palaiseau, France) et al. *In its* Energy Balance of the Tropical Systems (BEST). Conference on the Scientific Prospects on the Project p 183-217 1986 In FRENCH

Avail: NTIS HC A11/MF A01

A satellite-borne system to measure tropical region atmospheric parameters is proposed. The instruments include active and passive microwave radars, optical radar, and infrared radiometry. The main parameters to be measured are precipitation intensity, ocean or ground interfaces, evaporation flow, water vapor distribution, and integrated suspended liquid water content. The vertical temperature profile is also measured. A project expansion to Doppler lidar wind velocity measurement is also discussed. Instrument technical characteristics are described.

N87-24031\*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SPATIAL CHARACTERIZATION OF ACID RAIN STRESS IN CANADIAN SHIELD LAKES Progress Report, 1 Aug. 1985 - 1 Feb. 1986

FRED J. TANIS 1986 9 p (Contract NAS5-28779)

The acidification of lake waters from airborne pollutants is of continental proportions both in North America and Europe. A major concern of the acid rain problem is the cumulative ecosystem damage to lakes and forest. The number of lakes affected in northeastern United States and on the Canadian Shield is though to be enormous. The principle objective is to examine how seasonal changes in lake water transparency are related to annual acidic load. Further, the relationship between variations in lake acidification and ecophysical units is being examined. Finally, the utility of Thematic Mapper (TM) based observations to measure seasonal changes in the optical transparency in acid lakes is being investigated.

N87-24032\*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SPATIAL CHARACTERIZATION OF ACID RAIN STRESS IN CANADIAN SHIELD LAKES Progress Report, 1 Feb. - 1 Aug. 1986

FRED J. TANIS 1986 19 p (Contract NAS5-28779)

(NASA-CR-180982; NAS 1.26:180982; ERIM-189400-21-L) Avail: NTIS HC A02/MF A01 CSCL 13B

A major concern of the acid rain problem is the cumulative ecosystem damage to lakes and forests. The number of lakes affected in northeastern United States and on the Canadian Shield is thought to be enormous. Seasonal changes in lake transparency are examined relative to annual acidic load. The relationship between variations in take acidification and ecophysical units is being examined. Finally, the utility of Thematic Mapper (TM) based observations is being used to measure seasonal changes in the optical transparency in acid lakes.

B.G.

### 07

## DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

### A87-31412

INTERPRETATION OF THE POLARIMETRIC CO-POLARIZATION PHASE TERM IN RADAR IMAGES OBTAINED WITH THE JPL AIR-BORNE L-BAND SAR SYSTEM

WOLFGANG-M. BOERNER, BING-YUEN FOO, and HYO J. EOM (Illinois, University, Chicago) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, Jan. 1987, p. 77-82. refs

The utilization of both polarimetric amplitude and relative phase terms of the polarization scattering matrix given for each pixel, is pursued for polarimetric SAR imagery interpretation. The existing amplitude-only backscattering approaches hitherto used are extended and modified to accommodate the interpretation of information contained in the amplitude and/or phase terms. Both a vector radiative transfer model for surface versus volume scattering from rough terrain with and without vegetation canopy and a high-frequency electrical curvature model for perfectly conducting surfaces are examined to come up with theoretical models that out-perform other hitherto known approaches. The developed models agree with the excellent polarimetric SAR imagery recently obtained with the JPL CV-990 dual-polarization

L-band (1.225 GHz) SAR system. Recommendations are made on how to further perfect the system for integration in the SIR-C and other future polarimetric SIR-SAR systems.

#### A87-32488

### SPECTRAL CLASSIFICATION OF LANDSAT-5 THEMATIC MAPPER DATA

SUEO UENO, YOSHIYUKI KAWATA, and TAKASHI KUSAKA (Kanazawa Institute of Technology, Ishikawa, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1577-1582. refs (Contract MOESC-60129032)

Image processing of TM data in a subscene site of 800 x 800 pixels over the Kanazawa area in Japan was performed using Landsat 5 TM computer-compatible tape (CCT) data preprocessed by NASDA. Based on the ground truth data with cartographic accuracy of 25-m span, classification was performed in both the supervised and the unsupervised schemes. The grey levels in the CCT were transformed into the principal components (PC) and the CCT and PC values were classified in both schemes. The supervised and unsupervised classifications of the TM data (summarized in terms of 16 cover types, such as water, urban area, rural area, rice fields, sand, cedar or mixed-conifer forests, etc.) have shown satisfactory statistical results for the grey levels in TM CCT and PC data.

### A87-32489

### CORRECTION FOR ATMOSPHERIC AND TOPOGRAPHIC EFFECTS ON THE LANDSAT MSS DATA

YOSHIYUKI KAWATA and SUEO UENO (Kanazawa Institute of Technology, Nonoichi, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2 . Tokyo, AGNE Publishing, Inc., 1986, p. 1583-1585. refs

A simple radiometric correction method is proposed for removing both the atmospheric and topographic effects from the Landsat MSS data. The application of the method proposed here to a real rugged-terrain image gives satisfactory results when the digital terrain data are available. The values of the necessary atmospheric parameters are computed from the LOWTRAN 5 Code. Lambert's law of reflection on the ground surface is assumed in this study.

### A87-32506

SIMULATION SOFTWARE OF SYNTHETIC APERTURE RADAR JIRO KOMAI, ITOSHI KOHNO (Earth Resources Satellite Data Analysis Center, Tokyo, Japan), MAKOTO ONO, and HIROKAZU TANAKA (Mitsubishi Electric Corp., Kamakura, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1705-1710.

Synthetic aperture radar (SAR) simulation software with a high simulation capacity for various kinds of simulation parameters is described. The software consists of eight major blocks: (1) the terrain model generation block; (2) radar characteristics simulation block; (3) scattering characteristics simulation block; (4) theoretical image generation block; (5) hologram generation block; (6) image reconstruction block; (7) image display block; and (8) image analysis and evaluation block. Good coincidence is found between simulated and actual SAR images.

#### A87-35183

## MIDAS - A NEW IMAGE-PROCESSING SYSTEM FOR REMOTE SENSING [MIDAS - EIN NEUES BILDVERARBEITUNGSSYSTEM FUER DIE FERNERKUNDUNG]

G. LOHMANN, H.-J. LOTZ-IWEN, W. MARKWITZ and R WINTER (DFVLR, Hauptabteilung angewandte Datentechnik, Oberpfaffenhofen, West Germany) IN: DFVLR, Annual Report 1985 Cologne, West Germany, Deutsche Forschungs- und Versuchsanstalt füer Luftund Raumfahrt, 1986, p. 70-74. In German.

MIDAS, a modular interactive decentralized computer interpretation system for second-generation satellite-remote-sensing images dveloped for use at the DFVLR remote-sensing data center, is described. In MIDAS, interactive workstations and a local image-processing (IP) computer (with display peripherals) are linked to the mainframe computer at DFVLR-Oberpfaffenhofen via a fast local-area network. The MIDAS software is essentially the UPSTAIRS system, comprising user software (utility programs, general IP programs, and sensor-specific and project-specific programs) and system-core software (database, computer interfaces, dialog manager, and virtual display system). The MIDAS structure and features are reviewed, and IHS and principal-components transformations of a Landsat TM image are presented as examples.

#### A87-35305

AUTOMATIC CLASSIFICATION OF POINTE D'ARCAY LANDSCAPES USING THEMATIC MAPPER DATA WITH THE AID OF A TEXTURAL ANALYSIS [CLASSIFICATION AUTOMATIQUE ASSISTEE PAR UNE ANALYSE DE TEXTURE, DES PAYSAGES DE LA POINTE D'ARCAY D'APRES DES DONNEES THEMATIC MAPPER]

DONG-CHEN HE (CNRS, Institut National des Sciences de l'Univers, Paris, France) and LI WANG (Ecole Normale Superieure, Montrouge, France) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 129-135. In French. refs

A method for the automatic classification of landscapes using Landsat-5 Thematic Mapper (TM) data is demonstrated with data of the Pointe d'Arcay (France) landscape obtained on April 12, 1984. A purely radiographic multispectral classification is first performed on the data of six TM bands (1, 2, 3, 4, 5, and 7) using an unsupervised algorithm of clustering around mobile centers. A textural analysis is then introduced to eliminate classification confusion between scene analysis classes, and an improvement over the purely radiographic classification is found. It is noted that because the textural analysis is based on a neighborhood of pixels, the resulting spatial resolution is decreased.

### A87-35313

# INTRODUCTION OF INITIAL CENTERS FOR THE ALGORITHM OF CLUSTERING AROUND MOBILE CENTERS [INTRODUCTION DE CENTRES INITIAUX POUR L'ALGORITHME D'AGREGATION AUTOUR DE CENTRES MOBILES]

DONG-CHEN HE (CNRS, Institut National des Sciences de l'Univers, Paris, France) and LI WANG (Ecole Normale Superieure, Montrouge, France) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 237-242. In French. refs

A method for the introduction of initial centers is proposed to improve the performance of the algorithm of clustering around mobile centers, eliminating the blind determination of the number of initial centers at the beginning of the algorithm. A simple histogram analysis permits the simultaneous determination of the number and optimum location of initial classes for an unsupervised classification. Using the example of a multispectral classification of Thematic Mapper data on the Arcachon basin, the present method is shown to be more accurate than the conventional method.

#### A87-35524

## DERIVATION OF A FAST ALGORITHM TO ACCOUNT FOR DISTORTIONS DUE TO TERRAIN IN EARTH-VIEWING SATELLITE SENSOR IMAGES

JOHN W. MARVIN, MARK L. LABOVITZ, and ROBERT E. WOLFE (SASC Technologies, Inc., Lanham, MD) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-25, March 1987, p. 244-251. refs

Earth-viewing satellite sensors (e.g., the Landsat 4/5 Thematic Mapper) produce images with nontrivial amounts of geometric distortion due to local terrain variations. Although correction formulas are easy to derive, the high frequency of terrain variation relative to pixel size means that excessive computer time is required to process a large digital image. This paper derives approximations to the correction geometry that reduce computer time by orders of magnitude. A statistical sensitivity analysis shows that the approximations do not adversely affect the accuracy of the results even under a very demanding error budget.

#### A87-35925

# PROBLEMS IN THE AUTOMATION OF MAP-COMPILATION PROCESSES ON THE BASIS OF REMOTE-SENSING DATA [PROBLEMY AVTOMATIZATSII SOZDANIIA KART NA OSNOVE AEROKOSMICHESKOI INFORMATSII]

A. P. VOROZHEIKIN, V. V. KISELEV, A. E. MENSHIKH, and M. E. SOLOMATIN Geodeziia i Kartografiia (ISSN 0016-7126), Dec. 1986, p. 31-34. In Russian.

#### A87-36359

### **REMOTE SENSING - HANDLING THE DATA**

DAVID SLOGGETT and JONATHAN WILLIAMS (Software Sciences, Ltd., Farnborough, England) Space (ISSN 0267-954X), vol. 3, Mar.-Apr. 1987, p. 8-11.

The processing and interpretation of environmental and earth resource data are examined. The active and passive sensors on satellites which detect electromagnetic radiation that is converted to digital signals and photographic images are described. The on board processing and the real-time or playback transmission of data are discussed. The procedures for processing the data into digital or photographic forms involve bulk correction of the data and the use of an image processing system and image processing techniques. Consideration is given to archiving and dissemination of the data. Proposed developments in remote sensing are also discussed.

### A87-36361

### **MAPPING FROM SPACE**

ANDREW WESTWELL-ROPER and STEPHEN BECKOW (MacDonald, Dettwiler and Associates, Ltd., Richmond, Canada) Space (ISSN 0267-954X), vol. 3, Mar.-Apr. 1987, p. 24-28.

The use of satellite imagery to produce maps of the earth is examined. The advantages provided to map production by the SPOT satellite, which provides planimetric and elevation data, the Panchromatic Linear Array of the satellite, and operational geocoding, are discussed. A review of the techniques involved in traditional map production is presented. The automated image processing of satellite data to produce maps is described; it is determined that satellite map production is more economical than photogrammetry. The digital mapping and geographic information systems used for the storage of mapping information are considered. The application of AI to image processing and map production is proposed.

### A87-36546

## LANDFORM INVESTIGATION UTILIZING DIGITALLY PROCESSED SATELLITE THEMATIC MAPPER IMAGERY

ARWYN RHYS JONES (Reading, University, England) Earth, Moon, and Planets (ISSN 0167-9295), vol. 37, Feb. 1987, p. 171-185. refs

Thematic Mapper (TM) images obtained by Landsat 4 in January 1983 are used to demonstrate the additional geomorphological detail that can be extracted from TM imagery using computer-assisted digital image processing. Single-band

enhancement techniques include contrast stretching and edge enhancement, and multiband processing techniques include the application of an Intensity-Hue-Color transformation to false color composites, and the ratioing of two spectral bands. More complex multivariate techniques considered include unsupervised classification and principal component analysis. Best results are obtained when a specific relationship exists between the spectral response and the physical properties of the phenomena under investigation.

### A87-36757

### STEREOSCOPIC LINE SCAN IMAGING AND SATELLITE CONTROL

A. DRESCHER, G. MAYER, and J. PULS (DFVLR, Oberpfaffenhofen, West Germany) IN: Yearbook 1986 I; DGLR, Annual Meeting, Munich, West Germany, Oct. 8-10, 1986, Reports . Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 45-48. refs

(DGLR PAPER 86-106)

An interactive and semiautonomous attitude control concept for satellites is proposed. The concept uses on-board and ground-based processing intelligence via two-way exchange of raw and processed data. The use of ground truth for image correction is reviewed, and attitude requirements for stereoscopy in planned satellites are discussed. Attitude control characteristics and proposed attitude control changes are examined.

C.D.

#### A87-37276

## COMBINING PANCHROMATIC AND MULTISPECTRAL IMAGERY FROM DUAL RESOLUTION SATELLITE INSTRUMENTS

JOHN C. PRICE (USDA, Remote Sensing Research Laboratory, Beltsville, MD) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, March 1987, p. 119-128. refs

A procedure is developed for combining high spatial resolution panchromatic data with lower resolution multispectral data in order to produce high spatial resolution digital data in multispectral form. Data simulating the French SPOT satellite were processed to resemble high altitude aerial photography, but image artifacts can hamper photointerpretative methods.

Author

### A87-37287

### MERGING MULTIRESOLUTION SPOT HRV AND LANDSAT TM DATA

R. WELCH and MANFRED EHLERS (Georgia, University, Athens) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, March 1987, p. 301-303. refs

Methods for merging multisensor and multiresolution satellite data in digital formats to create composite images with improved interpretability are described. A merged multiresolution data set from a test site located in Atlanta, Georgia and imaged by the Landsat-5 Thematic Mapper on April 4, 1985 and by the SPOT High Resolution Visible cameras on May 4, 1986 is evaluated. The use of the intensity-hue-saturation (IHS) color transformation procedures of Haydn et al. (1982) to merge Landat and SPOT images is discussed. It is noted that the IHS algorithm improves the quality of the SPOT and Landsat images, and the composites have spatial resolution properties similar to the reference panchromatic image and still retain the spectral discrimination qualities of the original multispectral data set.

### A87-37288

### THE DENALI IMAGE MAP

DOUGLAS R. BINNIE (USGS, EROS Data Center, Sioux Falls, SD) and ALDEN P. COLVOCORESSES (USGS, Reston, VA) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, March 1987, p. 307-310. refs

Mt. McKinley in Denali National Park, AK has perhaps the greatest relief of any land mountain in the world in that it rises over 5000 meters (17,000 feet) above its surrounding base. Thus, it presents the ultimate challenge to the mapmaker to produce a satellite image map that will not be badly distorted by relief displacement. Moreover, the area presents a stark contrast

between the snow/ice and summer vegetation coverage. Although prospective purchasers of the Denali National Park map will decide if the information portrayal is worthwhile, it is up to the mapmaker to determine how well this mountain mass can be correctly positioned and cartographically displayed. Because summer seasons are short and cloud-prone, the mapmaker had to select and match nine images from 5 years of Landsat multispectral scanner (MSS) coverage. This work was carried out at the EROS Data Center (EDC) using the digital Large Area Mosaic System (LAMS). Other special features of this map are that it is printed on plastic, which should extend its life and versatility, and it carries an updated line map on the reverse side. Both maps are at 1:250,000 scale and carry a UTM grid to facilitate referencing.

Author

### A87-37290

### MEASUREMENTS ON DIGITIZED HARDCOPY IMAGES

J. C. TRINDER (New South Wales, University, Sydney, Australia) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, March 1987, p. 315-321. refs

Aerial photographs, for which pointing precisions in the x, y, and z coordinates are known, have been digitized with effective square apertures ranging from 6.25 microns to 100 microns. The digitized data were reproduced as hardcopies and observed on a stereoplotter in order to determine precisions of observations. A comparison of these pointing precisions with those derived from the original aerial photographs reveals the magnitude of the aperture required for digitizing to ensure that the quality of the visual observations is maintained. Systematic errors in the positions of points observed in the images are determined by computer simulation and are related to pixel sizes. The studies indicate that visual observations to standard aerial photography are unaffected by digitizing if the pixel sizes are less than or equal to 25 microns; however, the rms of systematic errors in the digitized data attributed to the digitizing process can be about one-fifth of the pixel size.

Author

### A87-37801

### IMAGE PREPROCESSING FOR LINE DETECTION BASED ON LOCAL STRUCTURE ANALYSIS

ZHENG YU (Paris, Ecole Nationale Superieure des Mines, Valbonne, France; Beijing University, People's Republi and C. BARDINET (Ecole Normale Superieure; Paris, Ecole Nationale Superieure des Mines, Valbonne, France) CODATA Bulletin (ISSN 0366-757X), no. 62, Oct. 1986, p. 9-25. refs

A local two-stage image processing method for image transformation or smoothing is proposed. The two stages of the method are learning and application. Local structure analysis begins with a computer-based simulation of all the local structures within a specific area of image points resulting in grey-level distributions, which are classified in order to produce a decision model based on yes and no operation orders. The construction of the decision model, and the procedures for applying a decision model to images are described. The capabilities and limitations of this method are discussed. The two-stage image processing method is applied to NOAA AVHRR and Landsat TM data on Tanzania.

### A87-37802

### THE GEOMULTI DATABASE MANAGEMENT SYSTEM

J. M. MONGET (Paris, Ecole Nationale Superieure des Mines, Valbonne, France) CODATA Bulletin (ISSN 0366-757X), no. 62, Oct. 1986, p. 27-33.

The Geomulti system, which transforms remote sensing files into a geocoded data base, is described. The Geomulti system consists of: a multivariable coding system, a data base management system, supporting data structures, and a data query and manipulation package; the operations of each of these components are discussed. Data management is based on a geoparameter data base structure, which processes parameter files, peripheral data files, and output data files, and a geocode data structure, which processes tape or disk files. The data structures are implemented using an extension of the VIPS-MGO system to enable definition and handling of data structures as objects. The system

is applicable to multisatellite remote sensing, environmental cartography, and mineral inspection. A diagram of the system's global file organization is presented.

#### A87-37803

### MULTISATELLITE DATA PROCESSING

C. BARDINET (Ecole Normale Superieure, Paris, Ecole Nationale Superieure des Mines, Valbonne, France) and J. M. MONGET (Paris, Ecole Nationale Superieure des Mines, Valbonne, France) CODATA Bulletin (ISSN 0366-757X), no. 62, Oct. 1986, p. 35-49.

The use of multisatellite data processing in discriminating geographical and geological units or objects in different types of environments is examined. The efficiencies of Meteosat and Landsat, or NOAA6-7 and Tiros-N, or Meteosat and NOAA-Tiros N data in digital form are evaluated. The multisatellite digital image processing phases are: (1) geometric rectification of the graphic data set, (2) multispectral data classification, (3) smoothing and filtering processes, and (4) computer-aided mapping. The methodologies for geometric rectification and for classification are described.

### A87-37922#

### AVHRR DATA SERVICES IN EUROPE - THE EARTHNET APPROACH

L. FUSCO and K. MUIRHEAD (ESA, Earthnet Programme Office, Frascati, Italy) ESA Bulletin (ISSN 0376-4265), no. 49, Feb. 1987, p. 9-19.

Characteristics of the current AVHRR on the NOAA polar-orbiting meteorological satellites are described, and the ESA/Earthnet scheme for the coordinated acquisition, archiving, processing, and dissemination of its data is discussed. Extensive usage of AVHRR data for applications including regional and global vegetation monitoring and air and sea pollution monitoring is possible due to its low data costs, high radiometric resolution, and repetitive, large-area coverage. The Earthnet scheme will include a historical dataset for all areas of interest, an internationally-accessible on-line catalogue, and fully-annotated user products in raw form or preprocessed to geophysical values. Standardization of the tape format using the international Group is also discussed.

### A87-38096\* Boston Univ., Mass.

### THE FACTOR OF SCALE IN REMOTE SENSING

CURTIS E. WOODCOCK (Boston University, MA) and ALAN H. STRAHLER (Hunter College, NY) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, April 1987, p. 311-332. refs (Contract NAS9-16664; NASA ORDER L-200080)

A method that measures the spatial structure of images as a function of spatial resolution is presented for selecting the appropriate scale for remote sensing. Graphs are obtained by imaging the scene at fine resolution and then collapsing the image to successively coarser resolutions while calculating the local variance. For the spatial resolution of SPOT and TM imagery, local image variance is relatively high for forested and urban/suburban environments, indicating that information-extraction techniques using texture, context, and mixture modeling are appropriate for these sensor systems. For agricultural environments where local variance is low, more traditional classifiers are appropriate.

### A87-38098\* Florida Univ., Gainesville.

## COMPARISON OF HCMM AND GOES SATELLITE TEMPERATURES AND EVALUATION OF SURFACE STATISTICS

E. CHEN (Florida, University, Gainesville) and L. H. ALLEN, JR. (Florida, University; USDA, Agricultural Research Station, Gainesville) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, April 1987, p. 341-353. refs (Contract NAS5-26453)

Infrared data from GOES and HCMM satellites for areas in northern central and southern Florida were compared for February 1, 1979 to examine spatial variations of surface temperatures within

GOES pixels using nested HCMM pixel surface temperatures. Standard deviations of HCMM pixel temperatures associated with mean temperature of a GOES pixel temperature during this period were found to be smallest for homogeneous water surfaces (about 0.5 K), to be slightly larger for homogeneous land surfaces (about 0.1 K), and to range up as high as 3.5 K for mixed water-land surfaces.

### A87-39184

### RADIOMETRIC CORRECTION OF SAR IMAGES - A NEW CORRECTION ALGORITHM

DANIEL BEGIN, Q. H. J. GWYN, and FERDINAND BONN (Sherbrooke, Universite, Canada) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 385-398. Research supported by the Ministere de l'Education du Quebec. refs.

Spatial variations of the backscatter coefficient result from synthetic aperture radar imaging systems and their platforms. An adaptive algorithm has been developed to correct the multiplicative variation of the backscatter in the longitudinal (parallel to flight line) and lateral (perpendicular to flight line) directions. The coefficient of variational along the parallel and lateral profiles, which consist of the means of the pixels along these lines perpendicular to the respective profiles, is constant. This implies that the radiometric variations are multiplicative. Because standard correction methods such as polynomial transfer functions give unsatisfactory results, an adaptive correction algorithm was developed to correct these images. The algorithm produces a transfer function by means of a filtering window which moves along the profile in what is essentially a moving mean procedure. However, the length of the window is automatically adjusted as a function of the variation of the profile. The adjustment is based on a calculation of the probability that values to be included or excluded from the window belong to the included population. The effects of the successive correction steps were monitored using several thematic test sites. The resultant images provide both increased quality and quantity of data without any degradation of the statistical properties of the data. Author

### A87-39189

### SURFACE MODELS INCLUDING DIRECT CROSS-RADIATION - A SIMPLE MODEL OF FURROWED SURFACES

CS. FERENCZ, D. HAMAR, J. LICHTENBERGER, GY. TARCSAI (Eotvos Lorand Tudoman Yegyetem, Budapest, Hungary), and I. FERENCZ ARKOS (Budapesti, Muszaki Egyetem, Budapest, Hungary) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 449-465. Research supported by the Magyar Tudomanyos Akademia, and FOMI Remote Sensing Centre. refs

In the interpretation of measured reflectance data it is important to consider those surface radiation effects which make a significant contribution to the overall irradiation pattern. A model, which includes the direct cross-radiation effect between the surface elements, was constructed for furrowed bare soil surfaces. According to the model computations performed, the direct cross-radiation plays a significant role in the measured, reflected signal intensity. The computational method developed is suitable for including the direct cross-radiation effect in surface radiation models in the optical region.

A87-39192\* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
THEMATIC MAPPER BANDPASS SOLAR EXOATMOSPHERIC

IRRADIANCES

B. L. MARKHAM and J. L. BARKER (NASA, Goddard Space Flight Center, Greenbelt, MD) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 517-523. refs

Based on solar irradiance data published by Neckel and Labs (1984) and Iqbal (1983), the solar exoatmospheric irradiances for Thematic Mapper (TM) bands 1, 2, 3, and 4 have been calculated. Results vary by up to 1 percent from previous published values, which were based on the earlier data of Neckel and Labs. For TM bands 5 and 7, integrated solar exoatmospheric irradiances

have also been recalculated using solar irradiance data published by Labs and Neckel (1968), Arvesen et al. (1969), and Iqbal (1983). These irradiances vary by up to 6 percent from previously published results, which were based on data published by Thekaekara (1972).

### A87-41925

PHYSICAL PRINCIPLES OF IMAGE CONVERGENCE IN REMOTE SENSING [FIZICHESKIE PRINTSIPY SOVMESHCHENIIA IZOBRAZHENII, POLUCHAEMYKH PRI DISTANTSIONNOM ZONDIROVANII]

A. G. ERMOLAEV, S. V. KIREEV, and IU. P. PYTEV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Moskovskii Universitet, Vestnik, Seriia 3 - Fizika, Astronomiia (ISSN 0579-9392), vol. 27, Nov.-Dec. 1986, p. 95-97. In Russian.

The instability of the trajectory and attitude of the satellite at the moment of remote sensing leads to the fact that any two images of the same part of the earth surface are recorded from two different points of view and at different angles. An image-correction technique is proposed for the processing of images obtained at different times. The technique is based on a physical model of image recording and mathematical methods of morphological analysis. The processing of Landsat images is considered as an example.

#### A87-42628

### AN EXPERT SYSTEM FOR LABELING SEGMENTS IN FORWARD LOOKING INFRARED (FLIR) IMAGERY

G. A. ROBERTS (Ford Aerospace and Communications Corp., Newport Beach, CA) IN: Applications of artificial intelligence III; Proceedings of the Meeting, Orlando, FL, Apr. 1-3, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 50-57. refs

An expert system for labeling high priority potential targets, low priority potential targets, roads, trees, forests, and potential clearings in FLIR imagery is presented. This expert system consists of three stages: the initial labeling experts, initial label conflict resolution, and a final relaxation labeling stage. The techniques used in these stages are presented. Examples of segmentation and segment labeling are shown.

**A87-42659\*** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### **OPTICAL IMAGE SUBTRACTION TECHNIQUES, 1975-1985**

HUA-KUANG LIU and TIEN-HSIN CHAO (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Hybrid image processing; Proceedings of the Meeting, Orlando, FL, Apr. 1, 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 55-65. refs

Real- and nonreal-time optical image subtraction (OIS) techniques are reviewed. Real-time OIS techniques include source encoding, polarization modulation, pseudocolor image difference detection, the holographic shear lens technique, and nonlinear optics. Included in the nonreal-time category are speckle diffuser encoding, speckle-pattern encoding, halftone screen encoding, and polarization-shifted encoding. It is concluded that the most useful techniques are the real-time operations. It is noted that some nonreal-time optical techniques can be applied directly while others may be converted into real-time ones through the use of advance real-time spatial light modulators or electrooptic devices. K.K.

N87-20449\*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

RADAR SCENE GENERATION FOR TACTICAL DECISION AIDS Final Report, 15 Apr. 1986 - 14 Apr. 1987

J. A. KONG 28 Apr. 1987 7 p

(Contract NAG5-769)

(NASA-CR-180234; NAS 1.26:180234) Avail: NTIS HC A02/MF A01 CSCL 17I

The Mueller matrix and polarization covariance matrix for polarimetric radar systems was studied. The clutter is modeled by a layer of random permittivity, described by a three-dimensional correlation function, with variance, and horizontal and vertical

correlation lengths. A general mixing formula was derived for discrete scatters immersed in a host medium. The results are applicable to general multiphase mixtures. The strong fluctuation theory was used to derive the backscattering cross sections, and was further extended to include higher order co-polarized and cross-polarized moments. A two-layer anisotropic random medium model was developed for the active and passive remote sensing of ice fields. A three-layer random medium model was adopted to study the volume scattering effects for the active and passive microwave remote sensing of snow-covered ice fields. The snow layer was simulated by an isotropic random medium and the ice layer by an anisotropic random medium. The vegetation canopy and snow-covered ice field were studied with a three-layer model, an isotropic random medium layer overlying an anisotropic random medium. The dyadic Green's function of the three-layer medium and the scattered electromagnetic intensities with Born approximation were calculated. RG

N87-20554\*# Boeing Aerospace Co., Seattle, Wash.
NASA/MSFC LARGE STRETCH PRESS STUDY

M. W. CHOATE, W. P. NEALSON, G. C. JAY, and W. D. BUSS Apr. 1985 138 p. (Contract NAS8-35969)

Mueller matrix and polarization covariance matrix for etric radar systems were studied. The clutter is modeled by a layer of random permittivity, described by a three-dimensional correlation function, with variance, and horizontal and vertical correlation lengths. Theoretical predictions were matched with experimental data for vegetation fields. A general mixing formula was derived for discrete scatters immersed in a host medium. The results are applicable to general multiphase mixtures. The strong fluctuation theory was used to derive the backscattering cross sections and was further extended to include higher order co-polarized and cross-polarized moments. A two-layer anisotropic random medium model was developed for the active and passive microwave remote sensing of ice fields. A three-layer random medium model was adopted to study the volume scattering effects for the active and passive microwave remote sensing of snow-covered fields. The snow layer was simulated by an isotropic random medium and the ice layer by an anisotropic random medium. The vegetation canopy and snow-covered ice field were studied with a three-layer model, an isotropic random medium layer overlying an anisotropic random medium. The dyadic Green's function of the three-layer medium and the scattered electromagnetic intensities with Born approximation were calculated. B.G.

N87-22278 Regione del Veneto, Mestre-Venezia (Italy).
COMPARATIVE EVALUATION AND GUIDE FOR THE INTEGRATED UTILIZATION OF LANDSAT (MSS AND TM) AND SPOT (HRV) SATELLITES REMOTELY SENSED DATA (VALUTAZIONE COMPARATA E GUIDA ALLUSO INTEGRATED D EI DATI TELERILEVATI DAI SATELLITI LANDSAT (MSS E TM) E SPOT (HRV)]

ALESSANDRO ANNONI and ENRICO ZINI 1986 149 p In ITALIAN Sponsored by the CIPE, and the Fondo di Investimenti (ETN-87-99356) Avail: Issuing Activity

A LANDSAT/SPOT user's manual is presented, including the description of both types of satellite, their performance, and the data characteristics. Data processing is illustrated, several procedures are explained, and useful parameters are given. ESA

N87-23014# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

AN EVALUATION OF THE POLAR ICE PREDICTION SYSTEM Final Report

W. B. TUCKER, III and W. D. HIBLER, III Feb. 1987 98 p (AD-A178522) Avail: NTIS HC A05/MF A01 CSCL 08L

The Polar Ice Prediction System (PIP) is a numerical ice forecasting system that has been implemented at the U.S. Navy Fleet Numerical Oceanographic Center (FNOC). The PIPS model

is run as a 24-hr timestep out to 144 hours (6 days) on a 47 x 25 grid at a resolution of 127 Km. This grid covers the entire Arctic basin as well as the Greenland and Norwegian Seas. Graphic forecast products are transmitted via the Naval Environmental Display Systems to the Naval Polar Oceanographic Center (NPOC) for guidance in preparation of weekly ice forecasts Primary products are ice drift, thickness, concentration and divergence. A two-phased evaluation of PIPS was conducted. The first extended from 15 Nov 1985 until 15 March 1986 while the second phase ran from 15 June until 15 Oct 1986. As well as covering periods of ice growth and decay, the model was initialized differently for the two phases. During Phase I, the model self-generated its initial concentration field from analysis atmospheric forcing fields. For Phase II, the digitized ice analysis prepared by NPOC was used to update the model each week.

N87-24011# Los Alamos National Lab., N. Mex. AN ATMOSPHERIC CORRECTION ALGORITHM FOR REMOTE IDENTIFICATION OF NON-LAMBERTIAN SURFACES AND ITS RANGE OF VALIDITY

A. GRATZKI and S. A. W. GERSTL 20 Feb. 1987 6 p Presented at IGARSS '87, Ann Arbor, Mich., 18 May 1987 (Contract W-7405-ENG-36)

(DE87-006059; LA-UR-87-571; CONF-870576-2) Avail: NTIS HC A02

The usefulness of remotely sensed surface data depends on the ability to correct for atmospheric pertubations on the image. An atmospheric correction algorithm has been proposed which removes atmospheric pertubations from off-nadir measured radiances at the top of the atmosphere in the visible and near-infrared wavelength region. The ability of the model to reproduce radiance distributions at the surface from radiances at the top of the atmosphere is tested and found to be better than 15%. The correction formalism requires as minimum information the total optical depth of the atmosphere and the surface albedo. In this study the accuracy of the model to assumptions about the aerosol phase function, the single-scattering albedo and the vertical profile of the optical depth is also tested.

N87-24013# Geological Survey, Reston, Va. National Mapping Div.

## RADAR AS A COMPLEMENT TO TOPOGRAPHIC MAPS FOR DELINEATING MARINE TERRACES Open File Report

J. L. PLACE Dec. 1986 15 p (PB87-154597; USGS/OFR-86/010) Avail: NTIS HC A02/MF A01 CSCL 08B

In special situations, side-looking airborne radar images can be used to complement topographic maps for locating and mapping marine terraces on mountainous coasts. When a radar image and a topographic map are superimposed in a Zoom Transfer Scope, the two data sources enhance each other to provide more information than is available from either alone. For locating marine terraces on mountainous coasts, a radar view that is parallel with the coast of looking offshore apparently produces a more interpretable image than a view straight in toward the land. This technique has not proven to be equal to field work for terrace mapping, but it should be faster and less expensive for a preliminary terrace delineation. Radar images form the SEASAT satellite were also tested, but without notable success; the side-looping airborne radar images were generally superior for terrace delineation.

GRA

N87-24014# Los Alamos National Lab., N. Mex.
MODELLING OF ATMOSPHERIC EFFECTS ON THE ANGULAR
DISTRIBUTION OF A BACKSCATTERING PEAK

B. J. POWERS and S. A. W. GERSTL 20 Feb. 1987 5 p Presented at the IGARSS '87, Ann Arbor, Mich., 18 May 1987 (Contract W-7405-ENG-36)

(DE87-006060; LA-UR-87-572; CONF-870576-1) Avail: NTIS HC A02/MF A01

If off-nadir satellite sensing of vegetative surfaces is considered, understanding the angular distribution of the radiance exiting the atmosphere in all upward directions is of interest. Of particular

interest is the discovery of those reflectance features which are invariant to atmospheric perturbations. When mono-directional radiation is incident on a vegetative scene a characteristic angular signature called the hot-spot is produced in the solar retro-direction. The remotely sensed hot-spot is modified by atmospheric extinction of the direct and reflected solar radiation, atmospheric backscattering, and the diffuse sky irradiance incident on the surface. It is demonstrated, however, by radiative transfer calculations through model atmospheres that at least one parameter which characterizes the canopy hot-spot, namely its angular half width, is invariant to atmospheric perturbations.

DOE

N87-24741# Stuttgart Univ. (West Germany).
IMPROVEMENT OF IMAGE QUALITY BY FORWARD MOTION
COMPENSATION, A PRELIMINARY REPORT

FRIEDRICH ACKERMANN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 25-32 Nov. 1986

Avail: NTIS HC A99/MF A01

Aerial photographs with and without forward motion compensation were compared. Measuring precision and geometrical accuracy in plan and height, and image quality as expressed by transfer functions were studied. Results confirm that air survey cameras with linear compensation of the forward motion during exposure permit longer exposure times and high resolution films. The direct result is visibly improved resolution, better image interpretation, and better measuring precision.

N87-24753# Khartoum Univ. (Sudan).

OPTICAL AND DIGITAL SAR PROCESSING TECHNIQUES: A STATISTICAL COMPARISON OF ACCURACY USING SEASAT IMAGERY

ABDALLA ELSADIG ALI In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 131-139 Nov.

Avail: NTIS HC A99/MF A01

Geometric accuracy of SEASAT synthetic aperture orbital radar images was tested. Each of four images was processed using different SAR processing systems and methodologies. Image coordinates of selected points were measured and transformed to the terrain system using mathematical transformations. Comparison of the known terrain coordinates and the transformed image coordinates of these points on each image allowed various statistical characteristics to be derived and showed the capability of each of the processing systems tested in producing accurate SAR images. Results show that application of an affine transformation can substantially eliminate differential scale errors in optically processed images. Error magnitude in digitally processed images are much lower, and differential scale errors are eliminated.

N87-24754# Technische Univ., Hanover (West Germany). Inst. for Photogrammetry and Engineering Surveys.

### INTRODUCTION OF GEOMETRIC INFORMATION TO RADAR IMAGE DATA

G. KONENCY and W. SCHUHR In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 141-147 Nov. 1986

Avail: NTIS HC A99/MF A01

To improve the geometric accuracy of initial radar image data, the introduction of additional geometric information to radar image data, e.g., ground control point coordinate values, terrain heights, and information about the behavior of the sensor is described. The derived formulas and practical results, especially for a more precise slant to groundrange conversion process, are suggested to serve the user with geometrically more precisely corrected basic SAR image data.

N87-24791# Xian Research Inst. of Surveying and Mapping (China).

ESTIMATING PHOTOGRAMMETRIC PRECISION AND CARTOGRAPHIC POTENTIAL OF SPACE IMAGERY

RENXIANG WANG In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 433-438 Nov. 1986

Avail: NTIS HC A99/MF A01

Photogrammetric precision and cartographic potential of metric photo and linear array images to be acquired from shuttle or satellite are assessed. The optional overlap of the metric photos for stereoploting is discussed. The 40% overlap may be the best option. The two categories of imagery for photogrammetry and remote sensing are reviewed.

N87-24799# Technische Univ., Vienna (Austria). Inst. fuer Vermessungswesen und Fernerkundung.

### PHOTOGRAPHIC QUALITY OF COLOR IR AERIAL PHOTOS AS A FUNCTION OF ATMOSPHERIC PARAMETERS

W. SCHNEIDER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 505-509 Nov. 1986 Sponsored by the Austrian Fonds zup Foerderung der Wissenschaftlichen Forschung

Avail: NTIS HC A99/MF A01

The relationship between the contrast of color CIR aerial photos, defined in terms of the image density range (width of density histogram) of a certain land cover type (spruce forest), and the atmospheric conditions during photo acquisition, defined in terms of the total normal optical thickness of the atmosphere as determined by simultaneous terrestrial spectroradiometric measurements, is analyzed. An empirical relationship between these quantities can be used to predict the contrast of aerial photos from terrestrial solar irradiance measurements prior to a planned photo flight.

N87-24804# Centre National d'Etudes Spatiales, Toulouse (France).

### SPOT IMAGE QUALITY

G. BEGNI, B. BOISSIN, and M. LEROY In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 551-556 Nov. 1986

Avail: NTIS HC A99/MF A01

Postlaunch assessment tests of SPOT image quality are summarized. In goemetric image quality, all specifications are fulfilled, most often with comfortable margins. Length distorsion is 1 order of magnitude better than the specification, due in part to the excellent quality of the satellite attitude control system. The radiometric image quality is also very satisfactory, except for relatively minor problems in signal to noise ratio in the HRV2 panchromatic band.

N87-24808# Canada Centre for Remote Sensing, Ottawa (Ontario).

### THE USE OF AUXILIARY DATE IN PHOTOGRAMMETRIC ADJUSTMENTS

J. R. GIBSON In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 583-588 Nov. 1986 Avail: NTIS HC A99/MF A01

Inertial Navigation System (INS) data were used in photogrammetric adjustments in an aerial hydrography project, photo inertial positioning project, laser profiler calibration project and stereo line imager project. The INS data provide an estimate of the aircraft position and attitude at specific time samples during a flight line. The INS data is known to be corrupted by long term drifts and offset errors, but provides relatively accurate differential data. The photogrammetric adjustment software models the low frequency error characteristics of the INS. Once the error model coefficients are determined, the derived INS error estimates may be computed and removed from the position and attitude data elements. The corrected INS data is then available for use in processing laser profiler data or for geometrically correcting line imager data.

N87-24814# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.

### IMAGE QUALITY PROBLEMS IN PRACTICAL AERIAL PHOTOGRAPHY

ANDERS E. BOBERG In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 627-634 Nov. 1986

Avail: NTIS HC A99/MF A01

Quality problems in land survey aerial photography are reviewed. The geometrical properties of the aerial cameras are checked yearly with the help of aerial photography of ice-covered lakes and stereoscopic height measurements in the images. Manual exposure determination with a correction table and automatic exposure calculation with a built-in integral or spot exposure meter are compared. Results of check measurements of the spectral transmission of color aerial filters are presented and quality problems related to color balance of color infrared film are discussed. Experiences of a subjective image assessment method are reported.

N87-24817°# California Univ., Santa Barbara. Information Sciences Research Group.

REMOTE SENSING INFORMATION SCIENCES RESEARCH GROUP: SANTA BARBARA INFORMATION SCIENCES RESEARCH GROUP, YEAR 4 Final Report

JOHN E. ESTES, TERENCE SMITH, and JEFFREY L. STAR 1 Jun. 1987 17 p

(Contract NAGW-455)

(NASA-CR-181073; NAS 1.26:181073) Avail: NTIS HC A02/MF A01 CSCL 05B

Information Sciences Research Group (ISRG) research continues to focus on improving the type, quantity, and quality of information which can be derived from remotely sensed data. Particular focus in on the needs of the remote sensing research and application science community which will be served by the Earth Observing System (EOS) and Space Station, including associated polar and co-orbiting platforms. The areas of georeferenced information systems, machine assisted information extraction from image data, artificial intelligence and both natural and cultural vegetation analysis and modeling research will be expanded.

### 08

### **INSTRUMENTATION AND SENSORS**

Includes data acquisition and camera systems and remote sensors.

### A87-32210#

THE NETHERLANDS-INDONESIAN REMOTE-SENSING SATELLITE TERS [DE NEDERLANDS-INDONESISCHE REMOTE SENSING SATELLIET TERS]

J. H. DE KOOMEN (Fokker, Amsterdam, Netherlands) Ruimtevaart, vol. 35, Dec. 1986, p. 1-12. In Dutch.

The development history of the Tropical Earth Resources Satellite (TERS) is briefly traced, and the results of the technical feasibility study completed in 1984 are summarized. The factors weighed before selecting a single-satellite configuration with a 1680-km-altitude equatorial orbit are discussed, and the instrument requirements are considered, including 16 x 16-m color (540, 650, and 795 nm) and 8 x 8-m panchromatic resolution, image size 60 x 60 km, observation at least four times per day between 10 deg S and 10 deg N latitude, and 1-km-resolution 3000-km-swath CCD cloud sensing (directed about 10 deg ahead of the instrument). Consideration is given to the on-board data-handling and telemetry/telecommand subsytems, the 800-W solar-panel/recharge-able-battery power supply, altitude control, instrument-pointing options, and the use of 5-mm-thick Al-alloy sandwich plates in the

 $1.1 \times 1.1 \times 2$ -m primary structure (to provide adequate radiation shielding).

#### A87-32349

### EARTH ROTATION, STATION COORDINATES AND ORBIT DETERMINATION FROM SATELLITE LASER RANGING

MASAAKI MURATA (National Aerospace Laboratory, Chofu. Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 1. Tokyo, AGNE Publishing, Inc., 1986, p. 557-565, refs

The Project MERIT, a special program of international colaboration to Monitor Earth Rotation and Intercompare the Techniques of observation and analysis, has come to an end with great success. Its major objective was to evaluate the ultimate potential of space techniques such as VLBI and satellite laser ranging, in contrast with the other conventional techniques, in the determination of rotational dynamics of the earth. The National Aerospace Laboratory (NAL) has officially participated in the project as an associate analysis center for satellite laser technique for the period of the MERIT Main Campaign (September 1983-October 1984). In this paper, the NAL analysis center results are presented.

#### A87-32477

## BALLOON-BORNE INFRARED MULTICHANNEL RADIOMETER FOR REMOTE SENSING OF HIGH RESOLUTION LOW-LEVEL WATER VAPOR FIELDS

VITO FRANCESCO POLCARO (CNR, Istituto di Astrofisica Spaziale, Frascati, Italy), CARLO ULIVIERI, ANTONIO CASTELLANI, and MAURIZIO DI RUSCIO (Roma, Universita, Rome, Italy) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1495-1502. refs

Consideration is given to the possibility of determining the total water vapor content in the atmosphere from simultaneous measurements in three thermal infrared channels between 10 and 13 microns. The paper describes a fast algorithm for estimating the low-level precipitable water in clear air from these multisplit window measurements. A linear correlation is found between the atmospheric water vapor content and an appropriate combination of radiometric brightness temperatures. The stratospheric flight of a balloon-borne radiometer designed for operation in the proposed wavelengths over the Mediterranean Sea during the summer of 1987 is detailed. The total weight expected for the payload is 240 kg. A floating altitude of 5 mb should be reached through the use of a three million-cubic foot balloon.

### A87-32491

### A STUDY OF ELEVATION MEASUREMENT USING LFC PHOTOGRAPH

SOTARO TANAKA, TOSHIRO SUGIMURA (Remote Sensing Technology Center of Japan, Tokyo), and MITSUNORI YOSHIMURA (Hosei University, Koganei, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1593-1600.

The capability of measuring the object point using large format camera (LFC) photographs acquired by the Space Shuttle STS-41 G was evaluated. From a set of films covering an area in Central Honshu, a stereo pair with a small area with mountains was selected, and the positions of the objects which could be identified on both photographs were determined. The steps of the procedure include earth curvature correction, determination of the projection center of the camera, angular orientation of the photograph, and finding the position of the object on the ground in the geodetic coordinate system. Target positions were determined with a positioning accuracy of 10 m in the horizontal direction and 20 m in the vertical direction. Factors that may cause deterioration of the positioning accuracy are discussed.

#### A87-32500

### AIRBORNE OBSERVATION EXPERIMENTS FOR MOS-1 VERIFICATION PROGRAM (MVP)

KOREHIRO MAEDA, YOSHIO AZUMA (National Space Development Agency of Japan, Hatoyama), and MASAHIRO KOJIMA (National Space Development Agency of Japan, Tokyo) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1659-1670.

The principal mission objectives of the Marine Obsevation Satellite-1 (MOS-1), scheduled for launch in February 1987, and the features and functions of the three radiometers (MESSR, VTIR, and MSR) to be carried by the MOS-1 are described. MVP, developed by NASDA to evaluate the total MOS-1 system by using the system's data obtained after launch, will evaluate the distortion correction method, the performance of the MOS-1 observation system, and the effectiveness of the MOS-1 observation parameter from the viewpoints of various utilizations. The evaluation results will be used in the development and operation of future earth observation systems. The results of the preliminary airborne observation experiments conducted by MVP using three radiometers equivalent to the MESSR, VTIR, and MSR, which yielded aerial photograph data over several test sites, are discussed.

### A87-32501

### **EARTH RESOURCES SATELLITE-1 (ERS-1)**

YOSHIHIRO ISHIZAWA, SHUNJI TAKAMURA, NORIO SAITO, and YOSHIHIRO HARADA (National Space Development Agency of Japan, Tokyo) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1671-1676. The ERS-1, designed for launch in FY 1990 by an H-I launch

The ERS-1, designed for launch in FY 1990 by an H-I launch vehicle, is described. Its mission objectives include the establishment of a fundamental technology of remote sensing from space by synthetic aperture radar and optical sensors; the exploration of nonrenewable resources; and the monitoring of land-use, agriculture, forestry, etc. An outline is given of the ERS-1 system with emplasis placed on its configuration, mission and bus equipment, orbit, data acquisition, and developmental status.

тк

### A87-32505

## SCIENTIFIC GOALS AND TECHNICAL LIMITATIONS OF THE SHUTTLEBORNE SYNTHETIC APERTURE EXPERIMENT X-SAR

HERWIG OETTL (DFVLR, Oberpfaffenhofen, West Germany) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1699-1704. BMFT-CNR-supported research. refs

The capabilities and scientific goals of the X-band SAR being developed for a 1990 Shuttle flight are summarized. The X-SAR will draw 1.4 kW, have a maximum data rate under 46 Mbit/sec, and hav a 12 x 0.4 m antenna. The X-SAR has linear vertical polarization with antenna gain exceeding 43 dBi, emit 40 microsec 9.6 GHz pulses, and have selectable slant range resolutions of 10 and 16 m. Azimuth resolution is to be 25 m and off-nadir viewing angles of 15-60 deg are to be available. From a 255 km altitude polar orbit, the X-SAR will be used to scan geologic formations, penetrate arid or semi-arid areas to detect different layers, and image layers of ice sheets, wet and dry snow status, and iceberg movements. Other goals are monitoring biomass density and waves, eddies, currents and pollution in the ocean. The X-SAR is eventually to be upgraded to include both copolarized and cross-polarized scanning.

#### A87-32507

### OBSERVATION OF PRECIPITATION FROM SPACE BY THE WEATHER RADAR

KENICHI OKAMOTO, HARUNOBU MASUKO, SHIN YOSHIKADO (Ministry of Posts and Telecommunications, Radio Research Laboratory, Koganei, Japan), KENJI NAKAMURA, MASAHARU FUJITA (Ministry of Posts and Telecommunications, Radio Research Laboratory, Kashima, Japan) et al. IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1711-1720. refs

Progress to date on the development of a spaceborne active microwave weather radar by the Japan Radio Research Laboratory is summarized. The experiments have included joint operation with NASA of an airborne microwave rain scatterometer/radiometer functioning in the X- (9.86 GHz) and Ka-bands (34.45 GHz). Features and performance of the jointly operated system are described, including the scanning patterns explored, the principal characteristics of the radiometers, and data processing and display subsystems, which furnished quick-look color imagery for viewing within the aircraft. Results are reported from comparisons of the rainfall rate estimates obtained with a least-squares method with equivalent data from a ground-based C-band radar, and from measurements of rainfall over the ocean in terms of the attenuation coefficient. Preliminary specifications are provided for a spaceborne weather radar system.

### A87-32952

### APPLICATIONS OF SATELLITE MICROWAVE RADIOMETRY IN FINLAND

MARTTI T. HALLIKAINEN (Helsinki University of Technology, Espoo, Finland) and PETRI A. JOLMA (Nokia Telecommunications, Espoo, Finland) Geocarto International, no. 4, 1986, p. 17-25. refs

Data from the Scanning Multichannel Microwave Radiometer (SMMR) onboard the Nimbus-7 Satellite were applied to: (1) retrieval of the water equivalent of seasonal snow cover, (2) discrimination of forest and surface types, (3) determination of the near-surface wind speed, and (4) determination of sea ice concentration. Several retrieval algorithms were tested in each case by using an extensive SMMR data set. The brightness temperature difference between 18 GHz and 37 GHz, vertical polarization, was observed to give the highest correlation coefficient with the manually measured snow water equivalent. The 10.7 GHz horizontally polarized SMMR channel has the best capability to distinguish between different forest and land-cover categories. The same channel yields the near-surface wind speed in the Baltic Sea (width about 200 km) with reasonably good accuracy. Previously developed wind speed algorithms have been applied only to areas far away from land. The use of the 18-GHz horizontally polarized channel to determine the sea ice concentration provides higher accuracy than that of the 37-GHz channel. Author

A87-32985\*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.

### IMPACT OF SATELLITE-BASED DATA ON FGGE GENERAL CIRCULATION STATISTICS

DAVID A. SALSTEIN, RICHARD D. ROSEN (Atmospheric and Environmental Research, Inc., Cambridge, MA), WAYMAN E. BAKER, and EUGENIA KALNAY (NASA, Goddard Space Flight Center, Greenbelt, MD) Royal Meteorological Society, Quarterly Journal (ISSN 0035-9009), vol. 113, Jan. 1987, p. 255-277. refs (Contract NAS5-26515; NAS5-27745)

The NASA Goddard Laboratory for Atmospheres (GLA) analysis/forecast system was run in two different parallel modes in order to evaluate the influence that data from satellites and other FGGE observation platforms can have on analyses of large scale circulation; in the first mode, data from all observation systems were used, while in the second only conventional upper air and surface reports were used. The GLA model was also integrated for the same period without insertion of any data; an independent objective analysis based only on rawinsonde and pilot balloon data is also performed. A small decrease in the vigor of

the general circulation is noted to follow from the inclusion of satellite observations.

### A87-33122 APPLIED REMOTE SENSING

CHOR PONG LO (Georgia, University, Athens) Harlow, England, Longman Scientific and Technical, 1986, 404 p. refs

The application of remote sensing to the surveying, inventorying, and mapping of characteristic features of the terrestrial environment is examined. The principles of electromagnetic remote sensing, the characteristics of major imaging sensor systems, space platforms and imaging systems, and methods for interpreting the images are described. The mapping of the spatial distribution of the population, and the analysis of meteorological data using remotely sensed information are discussed. Consideration is given to the use of aerial photography, thermal IR imagery, radar imagery, and satellite imagery to study of the lithosphere, biosphere, land use, land cover mapping, and hydrosphere. Attention is given to the cartographic presentation of remote sensing data and geographic information systems. Specific case studies illustrating the uses of remotely sensed data are presented.

A87-33426\* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

OPERATIONAL OVERVIEW OF NASA GTE/CITE 1 AIRBORNE INSTRUMENT INTERCOMPARISONS - CARBON MONOXIDE, NITRIC OXIDE, AND HYDROXYL INSTRUMENTATION

SHERWIN M. BECK, RICHARD J. BENDURA, DAVID S. MCDOUGAL, JAMES M. HOELL, JR., GERALD L. GREGORY, GLEN W. SACHSE, GERALD F. HILL (NASA, Langley Research Center, Hampton, VA), HOWARD J. CURFMAN, JR. (Bionetics Corp., Hampton, VA), ARNOLD L. TORRES (NASA, Wallops Flight Center, Wallops Island, VA), ESTELLE P. CONDON (NASA, Ames Research Center, Moffett Field, CA) et al. Journal of Geophysical Research (ISSN 0148-0227), vol. 92, Feb. 20, 1987, p. 1977-1985. refs

An overview of the airborne intercomparisons of CO, NO, and OH instrumentation is presented in this first paper of the series on the NASA Global Tropospheric Experiment/Chemical Instrumentation Test and Evaluation (GTE/CITE 1). This paper provides the reader with background information about several important characteristics of the project. These include the overall objectives and approach, the measurements taken, the intercomparison protocol, aircraft platform, profiles of each aircraft flight, and the participants. A synopsis of the overall results of the CO, NO, and OH instrument intercomparisons is also included. Companion papers discuss the detailed results of the CO and NO intercomparison tests as well as pertinent scientific findings.

Author

A87-35306° California Univ., Santa Barbara.
THE REGRESSION INTERSECTION METHOD OF ADJUSTING IMAGE DATA FOR BAND RATIOING

ROBERT E. CRIPPEN (California, University, Santa Barbara) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, Feb. 1987, p. 137-155. refs (Contract NAG5-177; NAGW-455)

Estimation of the combined path radiance and sensor offset terms is essential in adjusting multispectral image radiance measurements for band ratioing. Commonly applied techniques for making this estimate have required assumptions or ancillary information regarding the reflectance properties of surface materials. This paper presents a technique that is unique in that it provides absolute (not just relative) statistically-derived estimates without the use of ancillary information. It is termed the regression intersection method (RIM). RIM is based on contrasts between the spectral properties of various homogeneous areas in rugged terrain. These areas are selected by examination of the image data alone. Bispectral regression (first principal component) lines are determined for each area and are projected, in pairs, to intersection points. Ideally, the coordinates of these points must equal the measurements for zero ground radiance since that is the only condition under which spectrally different materials can have the same radiance values. The median result from several site-pair and band-pair comparisons is used in order to statistically mitigate noise and minor variations due to natural variability. Tests show that the method is successful in determining correction values for the image data that result in maximum removal of the topographic effect in ratio images.

## A87-35344 MODELS FOR RADAR SCATTERER DENSITY IN TERRAIN IMAGES

FRED W. SMITH (TAU Corp., Los Gatos, CA) and JANICE A. MALIN (Systems Control Technology, Inc., Palo Alto, CA) IEEE Transactions on Aerospace and Electronic Systems (ISSN 0018-9251), vol. AES-22, Sept. 1986, p. 642-647. (Contract F33615-83-C-1071)

Statistical models for the density of strong scatterers detected in high resolution radar images of rural terrain are presented. The probability distribution of the density of these natural terrain detections was found to be a negative binomial. The variance of the negative binomial depended strongly on the window size used to measure the density. This dependence indicates that these detections, like those of a Poisson process, are locally uncorrelated, but have a slowly varying mean density whose correlation distance is 1 km or more. Negative binomial parameters were computed using over 200 sq km of terrain image for densities measured using windows sized from 75 m x 75 m to 375 m x 375 m. Average terrain detection densities of 0.001 and 0.0001 per resolution cell were evaluated on images with resolutions of 7 and 28 ft.

#### A87-35502

ATMOSPHERIC ENVIRONMENT MONITORING SYSTEM BASED ON AN EARTH-TO-SATELLITE HADAMARD TRANSFORM LASER LONG-PATH ABSORPTION SPECTROMETER - A PROPOSAL

NOBUO SUGIMOTO (National Institute for Environmental Studies, Tsukuba, Japan) Applied Optics (ISSN 0003-6935), vol. 26, March 1, 1987, p. 763, 764.

The Hadamard transform laser long-path absorption spectrometer (Hallpass) for monitoring trace gases in the global atmosphere is described. The measurement principal is based on laser long-path absorption between a ground-based laser station and a satellite-borne detector in a stationary orbit; the Hadamard transform method is utilized to make simultaneous measurements from multiple stations. The operation of Hallpass, and the advantages of using the Halamard transform are discussed. The system is employed to evaluate the S/N of light detection. The Hallpass is effective for measuring trace gases in the troposphere and stratosphere and for regional and local pollution monitoring.

I.F.

### A87-36360 SENSORS FOR IMAGING

DOMINIC KING (Thomson-CSF, Division Tubes Electroniques, Boulogne-Billancourt, France) Space (ISSN 0267-954X), vol. 3, Mar.-Apr. 1987, p. 17-21. CNES-supported research.

Sensors for detecting radiation in the visible spectrum (0.4-0.8 micron) and short wave IR (SWIR) range of 1.55-1.70 microns are examined. The advantages of the SPOT pushbroom scanning system for earth observations and the implementation of a high resolution linear CCD into the SPOT-II satellite are discussed. The design and fabrication processes involved in developing a linear CCD with high sensitivity, low noise, good uniformity, resolution matching, and high reliability are described. A linear array of 3000 multiplexed InGaAs photodiodes for the SWIR channel on SPOT IV, which is to provide data applicable to agriculture, is proposed. The use of InGaAs for optical communications and of a two-dimensional matrix of photoelements for attitude control, and methods for improving CCD capabilities are studied.

#### A87-36933

ANALYSIS OF MODERATE AND INTENSE RAINFALL RATES CONTINUOUSLY RECORDED OVER HALF A CENTURY AND INFLUENCE ON MICROWAVE COMMUNICATIONS PLANNING AND RAIN-RATE DATA ACQUISITION

AUGUST BURGUENO, MANUEL PUIGCERVER (Barcelona Universidad, Spain), JOHN AUSTIN, and ENRIC VILAR (Portsmouth Polytechnic, England) IEEE Transactions on Communications (ISSN 0090-6778), vol. COM-35, April 1987, p. 382-395. refs

#### A87-37055

### WHAT, WHERE, WHEN ..., WHY? EXTRACTING INFORMATION FROM REMOTE SENSING DATA

NANNO J. MULDER (International Institute for Aerospace Survey and Earth Sciences, Enschede, Netherlands) ITC Journal (ISSN 0303-2434), no. 2, 1986, p. 145-155. refs

A remote sensing system which will improve the extraction and interpretation of remote sensing data is proposed and a scenario for the development of this system is presented. The basic principles of remote sensing are reviewed. The properties of photon and microwave sensors, the use of a square grid cell on the surface of the earth as the spatial unit of measurement for each scene element, and the class membership, position, and time of a scene element are discussed. The use of information systems to extract information from remote sensing data and the application of expert systems to information processing are described.

#### A87-37289

### **AEROTRIANGULATION WITHOUT GROUND CONTROL**

JAMES R. LUCAS (NOAA, Charting Research and Development Laboratory, Rockville, MD) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, March 1987, p. 311-314, refs

Optimum accuracy in conventional aerotriangulation requires ground control around the perimeter of the area at intervals of seven airbases or less, and, if precise elevations are to be determined, there must also be elevation control in the center of the area. Recent investigations indicate that it may be possible to derive observations of the exposure station positions with submeter accuracy from a technique that uses one Navstar Global Positioning System (GPS) receiver in the aircraft and another on the ground. A method for employing these additional observation data in an aerotriangulation adjustment is presented, along with results of simulations which indicate that accurate aerotriangulation may be achievable without any ground control. Attempts at experimental verification have been hindered so far by weather, equipment problems, the limited satellite constellation, and competition for the use of available receivers. More experiments are planned for the fall of 1986 Author

### A87-37421

### DATA COMPRESSION SYSTEM FOR VIDEO IMAGES

P. S. RAJYALAKSHMI and R. K. RAJANGAM (Indian Space Research Organization, Digital Systems Div., Bangalore, India) IN: ITC/USA/'86; Proceedings of the International Telemetering Conference, Las Vegas, NV, Oct. 13-16, 1986. Research Triangle Park, NC, Instrument Society of America, 1986, p. 573-583.

The software and hardware for the data compression system, which compresses and transmits remote sensing satellite images, are described. The data compression technique exploits the statistical properties of the satellite imagery and thereby reduces the data transmission rate. The use of transform coding for image data compression is examined; the Walsh-Hadamard transform was employed as the transform coding technique in this study. The number of quantization levels is estimated using zonal and threshold samplings. A diagram of the compression system hardware is presented, and the functions of the arithmetic logic unit are discussed. Evaluation of the system's performance reveals that the Walsh-Hadamard transform technique is effective for the compression of satellite video imagery.

### A87-38093\* SASC Technologies, Inc., Lanham, Md STOCHASTIC NATURE OF LANDSAT MSS DATA

M. L. LABOVITZ (SASC Technologies, Inc., Lanham, MD) and E. J. MASUOKA (NASA, Goddard Space Flight Center, Greenbelt, MD) Remote Sensing of Environment (ISSN 0034-4257), vol. 21, April 1987, p. 263-280. refs

A multiple series generalization of the ARIMA models is used to model Landsat MSS scan lines as sequences of vectors, each vector having four elements (bands). The purpose of this work is to investigate if Landsat scan lines can be described by a general multiple series linear stochastic model and if the coefficients of such a model vary as a function of satellite system and target attributes. To accomplish this objective, an exploratory experimental design was set up incorporating six factors, four representing target attributes - location, cloud cover, row (within location), and column (within location) - and two factors representing system attributes satellite number and detector bank. Each factor was included in the design at two levels and, with two replicates per treatment, 128 scan lines were analyzed. The results of the analysis suggests that a multiple AR(4) model is an adequate representation across all scan lines. Furthermore, the coefficients of the AR(4) model vary with location, particularly changes in physiography (slope regimes), and with percent cloud cover, but are insensitive to changes in system attributes. Author

A87-38837\* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### SPACEBORNE IMAGING RADAR RESEARCH IN THE 1990S - AN OVERVIEW

CHARLES ELACHI (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) (NASA, U.S. Navy, and Johns Hopkins University, Symposium on Measuring Ocean Waves from Space, Laurel, MD, Apr. 15-17, 1986) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 8, Jan.-Mar. 1987, p. 60-64. refs

Research and proposed experiments for improving the capabilities of spaceborne imaging radars are discussed. The development of multiparameter research sensors, long-term and global monitoring sensors, planetary mapping sensors, and topographic three-dimensional imagers is examined. The properties and functions of these proposed sensors are described; examples of these various types of sensors are provided.

### A87-39183

### THE TETHERED SATELLITE SYSTEM AS A NEW REMOTE SENSING PLATFORM

S. VETRELLA and A. MOCCIA (Napoli, Universita, Naples, Italy) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 369-383. Research supported by the Ministero della Pubblica Istruzione and CNR. refs

The characteristics and development of the Tethered Satellite (TS), which is to be a space platform that allows operation at different low altitudes, are described. Two experimental flights are proposed for the TS; the first mission involves deploying the tether 20 km upwards, and in the second mission the TS is to be deployed downwards to 100 km from the Shuttle. The attitude stability rates of the TS for along-track stereoscopic observations using linear arrays are analyzed. It is determined that an attitude stability rate of 10 to the -6th deg/sec is required for automatic correlation along epipolar planes during the proposed Mapsat mission and a rate of 0.00001 deg/sec is needed for the Stereosat mission.

I.F.

A87-39190\* Open Univ., Milton (England).

SYNERGISTIC USE OF MOMS-01 AND LANDSAT TM DATA DAVID A. ROTHERY and PETER W. FRANCIS (Open University, Milton Keynes, England) International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, March 1987, p. 501-508. Research supported by the Nuffield Foundation. refs

(Contract NAS2-8759)

Imagery covering the Socompa volcano and debris avalanche deposit in northern Chile was acquired by MOMS-01 when the sun was low in the western sky. Illumination from the west shows many important topographic features to advantage. These are

inconspicuous or indistinguishable on Landsat TM images acquired at higher solar elevation. The effective spatial resolution of MOMS-01 is similar to that of the TM and its capacity for spectral discrimination is less. A technique has been developed to combine the multispectral information offered by TM with the topographic detail visible on MOMS-01 imagery recorded at a time of low solar elevation.

### A87-39457

### IMPACT OF RADIANCE VARIATIONS ON SATELLITE SENSOR CALIBRATION

MICHAEL J. DUGGIN (New York, State University, Syracuse) Applied Optics (ISSN 0003-6935), vol. 26, April 1, 1987, p. 1264-1271, refs

(Contract USDA-58-319T-40238X)

The intercalibration of digital data from different sensors depends on systematic and random variations in factors controlling recorded radiance. Theoretical expressions are presented which describe the impact of random variations in those factors which control radiance incident on the sensor. Means of measuring or estimating the impact of random variations on intercalibration factors are discussed. Means of detecting and calibrating for systematic effects are also discussed. The optical-reflectivation middle-infrared, and thermal infrared regions of the spectrum are considered. An example is presented whereby NOAA-7 and NOAA-8 advanced very high resolution radiometer (AVHRR) radiance data, obtained over the same test fields, are shown to depend on the differences in view angles used by the two satellites.

#### A87-40246

### SATELLITE ESTIMATION OF A SOLAR IRRADIANCE AT THE SURFACE OF THE EARTH AND OF SURFACE ALBEDO USING A PHYSICAL MODEL APPLIED TO METEOSAT DATA

G. DEDIEU, P. Y. DESCHAMPS, and Y. H. KERR (CNES and CNRS, Laboratoire d'Etudes et de Recherches en Teledetection Spatiale, Toulouse, France) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 26, Jan. 1987, p. 79-87. CNES-CNRS-supported research. refs

**A87-40379\*#** National Aeronautics and Space Administration, Washington, D.C.

### SPACE REMOTE SENSORS

SAM KELLER (NASA, Office of Space Science and Applications, Washington, DC) IN: EASCON '86; Proceedings of the Nineteenth Annual Electronics and Aerospace Systems Conference, Washington, DC, Sept. 8-10, 1986. New York, Institute of Electrical and Electronics Engineers, Inc., 1986, p. 260-264.

Space remote sensors are analyzed as a component of a higher level 'robotic' system and the implications for sensor parameter selection and priority assignment are described. The EOS program and three of its particular sensor types are considered as examples of the principles discussed.

Author

### A87-40756

### SIMULATIONS OF THE GOES VISIBLE SENSOR TO CHANGING SURFACE AND ATMOSPHERIC CONDITIONS

R. T. PINKER and J. A. EWING (Maryland, University, College Park) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, April 20, 1987, p. 4001-4009. refs (Contract NOAA-NA-84AAH00026)

Numerical experiments have been conducted to simulate the GOES VISSR visible sensor's response under varying surface and atmospheric conditions, as a function of solar zenith angle. The possible bias in the information obtained with this limited spectral response sensor was assessed by comparing the narrow-band filtered clear-sky planetary albedo, as observable with the VISSR, with the broadband unfiltered planetary albedo under the same on irronmental conditions. Four cases of wavelength-dependent surface albedo and three atmospheric conditions have been simulated. It was demonstrated that the relationship between the filtered and the broadband planetary albedo depends primarily on the assumptions made about the magnitude and wavelength

dependence of the surface albedo and, to a lesser extent, on the atmospheric conditions. Author

### A87-40768\* Science Applications Research, Lannam, Md REFLECTIVITY OF EARTH'S SURFACE AND CLOUDS IN ULTRAVIOLET FROM SATELLITE OBSERVATIONS

T. F. ECK (Science Applications Research, Lanham, MD), P. K. BHARTIA (ST. Systems Corp., Hyattsville, MD), P. H. HWANG (NASA, Goddard Space Flight Center, Greenbelt, MD), and L. L. STOWE (NOAA, National Environmental Satellite Data Information Service, Washington, DC). Journal of Geophysical Research (ISSN 0148-0227), vol. 92, April 20, 1987, p. 4287-4296. refs

The Total Ozone Mapping Spectrometer on board Nimbus 7 is used to infer the UV surface and cloud reflectance at 370 nm. Cloudless surface reflectivity was analyzed on a global basis for all surface types for several months. The UV surface reflectivity varies from 2 percent for some forest and grassland regions to 14 percent for some sandy desert areas. A note le exception is the large salt flats of Bolivia, which have a reflectivity of about 60 percent. Cloud reflectivity was also analyzed for clouds located at three levels in the atmosphere, as determined by the 11.5 micron channel of the Temperature Humidity Infrared Radiometer. Average cloud reflectivity at 370 nm ranges from 52 percent for low clouds (tops less than 2 km) to 76 percent for high clouds (tops greater than 7 km at the equator, decreasing to greater than 4 km at poles).

### **A87-40770\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

### SATELLITE SENSING OF AEROSOL ABSORPTION

YORAM J. KAUFMAN (NASA, Goddard Space Flight Center, Greenbelt, MD) Journal of Geophysical Research (ISSN 0148-0227), vol. 92, April 20, 1987, p. 4307-4317. refs

A method is developed for remote sensing of aerosol absorption from satellite images of the earth's surface. The method is based on the measurement of the change in the upward radiances between a clear and a hazy day over a varying surface reflectance. For a zero change balance between brightening due to scattering and darkening due to absorption and scattering is reached. This balance is utilized via a radiative transfer model to derive the aerosol single-scattering albedo. A sensitivity study is performed, and the method is tested against laboratory measurements. It is suggested that for the case of haze introduced on top of an existing background aerosol and with a fair estimate of the scattering phase function, the error in the remotely sensed single-scattering albedo is in the range of 0.03-0.05. The main errors in the method arise from variations in the surface reflectance between the clear and the hazy days, uncertainty in the scattering phase function, and variation of the aerosol and gaseous absorption between these two days. If the satellite calibration varies with time, the measurements of single-scattering albedo can be substantially affected. Author

### A87-41432

### RADIOMETRIC COMPARISON OF THE LANDSAT-5 TM AND MSS SENSORS

ALAIN ROYER, LISE CHARBONNEAU, RICHARD BROCHU (Sherbrooke, Universite, Canada), JENNIFER M. MURPHY, PHILIPPE M. TEILLET (Canada Centre for Remote Sensing, Ottawa) et al. International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, April 1987, p. 579-591. Research supported by the Canada Centre for Remote Sensing and FCAR. refs (Contract NSERC-A-8643; NSERC-A-5252)

The radiometric accuracy of Landsat-5 TM data and MSS data is evaluated. The TM and MSS images employed in the study were recorded simultaneously over Montreal on August 4, 1984. The radiometric and geometric correction procedures of the Canada Center for Remote Sensing are described. TM and MSS normalized and corrected apparent reflectances computed for 11 different cover types (four water areas, three urban areas having different densities, and four vegetative surfaces) are compared. It is observed that the normalized and corrected apparent reflectances

from TM and MSS correlate well; and the usefulness of the processing procedure is validated.

### A87-41588

### GROUND AND AERIAL USE OF AN INFRARED VIDEO CAMERA WITH A MID-INFRARED FILTER (1.45 TO 2.0 MICRONS)

J. H. EVERITT, D. E. ESCOBAR, P. R. NIXON (USDA, Remote Sensing Research Unit, Weslaco, TX), M. A. HUSSEY (Texas A&M University, Weslaco), and C. H. BLAZQUEZ (Florida, University, Lake Alfred) IN: Thermal imaging; Proceedings of the Meeting, Orlando, FL, Apr. 3, 4, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 130-135. refs

A black-and-white infrared (0.9 to 2.2 micron) video camera, filtered to record radiation within the 1.45 to 2.0 microns midinfrared water absorption region, was evaluated with ground and aerial studies. Imagery of single leaves of seven plant species (four succulent; three nonsucculent) showed that succulent leaves were distinguishable from nonsucculent Spectrophotometric leaf reflectance measurements made over the 1.45 to 2.0 microns confirmed the imagery results. Ground-based video recordings also showed that severely drought-stressed buffelgrass (Cenchrus ciliaris L.) plants were distinguishable from the nonstressed and moderately stressed plants. Moreover, the camera provided airborne imagery that clearly differentiated between irrigated and nonirrigated grass plots. Due to the lower radiation intensity in the mid-infrared spectral region and the low sensitivity response of the camera's tube, these video images were not as sharp as those obtained by visible or visible/near-infrared sensitive video cameras. Nevertheless, these results showed that a video camera with midinfrared sensitivity has potential for use in remote sensing research and applications. Author

**A87-42254\*** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### RECTIFICATION OF TERRAIN INDUCED DISTORTIONS IN RADAR IMAGERY

RONALD KWOK, JOHN C. CURLANDER, and SHIRLEY S. PANG (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, May 1987, p. 507-513. refs

This paper describes a technique to generate geocoded synthetic aperture radar (SAR) imagery corrected for terrain induced geometric distortions. This algorithm transforms the raw slant range image, generated by the signal processor, into a map registered product, resampled to either Universal Transverse Mercator (UTM) or Polar Stereographic projections, and corrected for foreshortening. The technique utilizes the space platform trajectory information in conjunction with a digital elevation map (DEM) of the target area to generate an ortho-radar map with near-autonomous operation. The current procedure requires only two to three tie-points to compensate for the platform position uncertainty that results in translational error between the image and the DEM. This approach is unique in that it does not require generation of a simulated radar image from the DEM or a grid of tie-points to characterize the image-to-map distortions. Rather, it models the inherent distortions based on knowledge of the radar data collection characteristics, the signal Doppler parameters, and the local terrain height to automatically predict the registration transformation. This algorithm has been implemented on a minicomputer system equipped with an array processor and a large random-access memory to optimize the throughput.

#### A87-42257

## COMPARISON BETWEEN DIGITAL AND MANUAL INTERPRETATION OF HIGH ALTITUDE AERIAL PHOTOGRAPHS

PAUL W. SNOOK, NORMAN E. MERRITT, RAYMOND L. CZAPLEWSKI (USDA, Forest Service, Fort Collins, CO), and KENNETH C. WINTERBERGER (USDA, Forest Service, Anchorage, AK) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 53, May 1987, p. 531-534. refs

Second generation color infrared transparencies of the Tanana River Basin in Alaska were digitized using a scanning microdensitometer. Unsupervised clustering was performed independently on each of 20 digital images. Area estimates from 20 8-hectare sample plots were obtained by manual and computer aided interpretations. Manual interpretation of large-scale (1:3000) photographs and ground truth served as reference. Computer-aided interpretation was consistently more accurate than the manual interpretation when compared to reference. However, the time and cost for digital processing was much higher than manual interpretation if information for only a small portion (e.g., an 8-ha plot) of the digital image is required.

## A87-42639\* California Univ., Davis. POLARIZED VIEWS OF THE EARTH FROM ORBITAL ALTITUDE

KINSELL L. COULSON (California, University, Davis), VICTOR S. WHITEHEAD (NASA, Johnson Space Center, Houston, TX), and CHARLES CAMPBELL (NASA, Johnson Space Center; Lockheed Engineering and Management Services Co., Houston, TX) IN: Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr. 2, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 35-41. NASA-supported research. 1985

By means of a pair of boresighted and synchronized cameras fitted with orthogonally oriented polarizing filters and carried aboard the Space Shuttle, a large number of polarized images of the earth's surface have been obtained from orbital altitude. Selected pairs of images, both in color and in black and white, have been digitized and computer processed to yield analogous images in each of the three Stokes parameters necessary for characterizing the state of linear polarization of the emergent light. Many of the images show surface properties more distinctly in degree and plane of polarization than in simple intensity alone. However, the maximum information content as well as noise suppression and minimization of atmospheric interference, is achieved by proper combinations of the Stokes parameters. It is believed that these are the first, and certainly the most extensive, set of polarized images of the earth ever obtained from space. Author

N87-20621# European Space Agency, Paris (France).
PROCEEDINGS OF THE EUROPEAN SYMPOSIUM ON POLAR
PLATFORM OPPORTUNITIES AND INSTRUMENTATION FOR
REMOTE-SENSING (ESPOIR)

E. J. ROLFE, ed. and B. BATTRICK, ed. Nov. 1986 127 p Symposium held in Avignon, France, 16-18 Jun. 1986 (ESA-SP-266; ISSN-0379-6566; ETN-87-99434) Avail: NTIS HC A07/MF A01

European activities in preparing the Columbus polar platforms; United States cooperation with Europe; atmosphere, land, ocean/ice, and solid Earth missions; and platform instruments, calibrating, data management, orbit configuration, and servicing were discussed.

**ESA** 

N87-20622# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).

THE EARTH OBSERVATION ACTIVITIES OF THE EUROPEAN SPACE AGENCY AND THE USE OF THE POLAR PLATFORM OF THE INTERNATIONAL SPACE STATION

B. PFEIFFER *In its* Proceedings of the European Symposium on Polar platform Opportunities and Instrumentation for Remote-sensing (ESPOIR) p 7-10 Nov. 1986

Avail: NTIS HC A07/MF A01

The Meteosat, ERS-1, and Earthnet programs are reviewed. The long term follow-on programs are outlined. Space infrastructure elements of ESA and their use for Earth observation are described. User requirements and ESA policy for a polar Earth observations platform are discussed.

N87-20624# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). EUROPEAN UTILIZATION ASPECTS STUDIES

F. SCHLUDE In ESA Proceedings of the European Symposium on Polar platform Opportunities and Instrumentation for Remote-sensing (ESPOIR) p 21-27 Nov. 1986

Avail: NTIS HC A07/MF A01

Starting from a synthesis of space station user data needs, a minimum instrumentation scenario was derived. Grouping of these instruments gave application oriented missions which led to two model missions that can be realized on an international two polar platform system.

N87-20634# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). LAND PANEL REPORT

J. BODECHTEL and F. LANZL In ESA Proceedings of the European Symposium on Polar platform Opportunities and Instrumentation for Remote-sensing (ESPOIR) p 79-83 Nov. 1986

Avail: NTIS HC A07/MF A01

International Space Station polar platform sensor configurations and missions are suggested. The platforms should maintain the capability for operational land remote sensing using optical sensors; improve the capability of optical sensors in terms of radiometric and spatial resolution, coverage, stereoscopic capability, etc.; improve experimental capabilities for allweather remote sensing of land with microwave sensors, to provide an operational capability similar to that of optical sensors; optimize the integration of microwave and optical data; set up demonstration programs in renewable resources, achieve operational status in the 1990s; and promote fundamental research activities.

N87-20642# Air/Ocean Remote Sensing Co., San Diego, Calif. SIMULATION OF WIND GRADIENT ERRORS IN NROSS (NAVY REMOTE OCEAN SENSING SYSTEM) RADAR SCATTEROMETER DATA IN A SIMPLIFIED GEOMETRY Final Report, May - Sep. 1986

JAMES L. MUELLER Aug. 1986 48 p (Contract N62271-86-M-0235)

(AD-A175754; AO1-1(ST1); NEPRF-CR-86-05) Avail: NTIS HC A03/MF A01 CSCL 17I

A set of simplified case studies is used to illuminate the effect of spatial gradients in normalized radar cross section (NRCS) on the accuracy of NRCS at NROSS (Navy Remote Ocean Sensing System) scatterometer (NSCAT) cell centroids, and at wind vector retrieval grid points displaced from the centroid. Values of linear and quadratic variables s(x,y) are estimated at the centroid and at a point displaced from the centroid of a parallelogram cell, using first the mean value (S) over the cell (a nearest neighbor or binning approach) and then a bilinear interpolation estimator Si(x,y). Isoparametric finite elements are used to take cell shape into account in the interpolation. At cell centroids with linear fields s(x,y), errors are negligible using either (S) or Si(x,y). At cell centroids with nonlinear fields s(x,y), errors using (S) and Si(x,y) both approach 0.5% (with interpolation errors being slightly less) at spatial gradients of 0.1 dB/km. At displaced points with linear

fields s(x,y), errors using interpolation Si(x,y) are negligible at all gradients, but error using cell means (S) exceeds 6% at gradients of 0.1 dB/km. At displaced points with nonlinear fields s(x,y), error using interpolation Si(x,y) approaches 2%, while error using cell means (S) exceeds 7%, near spatial gradients of 0.1 dB/km. The simulated errors associated with binning are large, and interpolation yields much better accuracy.

N87-21474# . International Meteorological Inst., Stockholm (Sweden). Arrhenius Lab.

### THE OBSERVATIONAL OBJECTIVES AND THE IMPLEMENTATION OF THE GLOBAL WEATHER EXPERIMENT

B. R. DOEOES In WMO Proceedings of the International Conference on the Results of the Global Weather Experiment and their Implications for the World Weather Watch, Volume 1 p 47-74 Apr. 1986

Avail: NTIS MF A01; print copy available from WMO, Geneva, Switzerland

The transformation of the main scientific objectives of the Global Weather Experiment into observational requirements and the design of the FGGE composite global observing system as eventually implemented are described. In addition to the surface based World Weather Watch Global Observing System it included geostationary and polar orbiting meteorological satellites, dedicated ships and long range aircraft making soundings in the equatorial tropics, constant level balloons drifting at 14 km providing observations of the atmospheric flow in the tropics, and buoys drifting in the southern ocean making observations at the sea surface. Meteorological data were obtained using a large number of commercial aircraft equipped with special observing systems. It is concluded that the observations obtained during the 2 Intensive Special Observing Periods (15 January to 20 February, and 10 May to 8 June, 1979) provided nearly all the data stated in the requirements for the Experiment. **ESA** 

N87-21521# World Climate Programme, Geneva (Switzerland).
REPORT OF THE WORKSHOP ON ASSIMILATION OF
SATELLITE WIND AND WAVE DATA IN NUMERICAL WEATHER
AND WAVE PREDICTION MODELS

Sep. 1986 69 p Workshop held in Shinfield Park, England, 25-26 Mar. 1986 Prepared in cooperation with ICSU, Rome, Italy

(WCP-122; WMO-TD-148; ETN-87-99183) Avail: NTIS MF A01; print copy available from WMO, Geneva, Switzerland

The assimilation of microwave data in atmospheric and wave models, and the relation between on-line data assimilation systems and quick-look and off-line analysis facilities were discussed. The assimilation system should provide gridded data of surface winds, surface stresses, surface fluxes of sensible and latent heat, and surface waves, using all the sensor data of oceanographic satellites with all other available conventional and (meteorological) satellite data. The generation of a multiyear, continuous time sequence of gridded surface stress and heat flux fields is essential for climatological studies. Since the data assimilation requirements of climate and forecasting applications are essentially identical, and most of the required data are routinely collected at forecasting centers, it is practical to implement the data assimilation system at global weather forecasting centers. Numerical experiments which can be carried out with SEASAT data to develop and test integrated data assimilation methods were identified.

N87-22281\*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SURFACE BIDIRECTIONAL REFLECTANCE PROPERTIES OF TWO SOUTHWESTERN ARIZONA DESERTS FOR WAVELENGTHS BETWEEN 0.4 AND 2.2 MICROMETERS

CHARLES H. WHITLOCK, G. CARLTON PURGOLD, and STUART R. LECROY (PRC Kentron, Inc., Hampton, Va.) May 1987 48 p

(NASA-TP-2643; L-16159; NAS 1.60:2643) Avail: NTIS HC A03/MF A01 CSCL 20F

Surface bidirectional reflectance characteristics are presented for the Sonora Desert and the Mohawk Valley at solar zenith

angles of 13, 31, and 57 degs at wavelengths between 0.4 and 1.6 microns. Nadir reflectance values are presented for wavelengths between 0.4 and 2.2 microns for solar zenith angles of 13, 17.5, 27, 31, 45, 57, and 62 degs. Data were taken from a helicopter during May 1985 in support of an Earth Radiation Budget Experiment (ERBE), a Stratospheric Aerosol Gas Experiment (SAGE II), and an Advanced Very High Resolution Radiometer (AVHRR) satellite validation experiment.

N87-22457\*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PROBLEMS IN MERGING EARTH SENSING SATELLITE DATA SETS

PAUL H. SMITH and MICHAEL J. GOLDBERG Mar. 1987 15 p

(NASA-TM-87820; REPT-87B0275; NAS 1.15:87820) Avail: NTIS HC A02/MF A01 CSCL 12B

Satellite remote sensing systems provide a tremendous source of data flow to the Earth science community. These systems provide scientists with data of types and on a scale previously unattainable. Looking forward to the capabilities of Space Station and the Earth Observing System (EOS), the full realization of the potential of satellite remote sensing will be handicapped by inadequate information systems. There is a growing emphasis in Earth science research to ask questions which are multidisciplinary in nature and global in scale. Many of these research projects emphasize the interactions of the land surface, the atmosphere, and the oceans through various physical mechanisms. Conducting this research requires large and complex data sets and teams of multidisciplinary scientists, often working at remote locations. A review of the problems of merging these large volumes of data into spatially referenced and manageable data sets is presented.

Author

N87-23012# Air Force Geophysics Lab., Hanscom AFB, Mass. ATMOSPHERIC REMOTE SENSING IN ARCTIC REGIONS GERALD W. FELDE, JAMES T. BUNTING, and KENNETH R. HARDY 1986 10 p Reprinted from the Department of Defense Symposium and Workshop on Arctic and Arctic-Related Environmental Sciences, 1986 p 1-8 (AD-A179550; AFGL-TR-87-0128) Avail: NTIS HC A02/MF A01 CSCL 08L

The particular features which must be considered when sensing arctic regions from space platforms include a generally dry atmosphere, thin and low water content clouds which often cover large areas, a highly reflective snow or ice background in the visible spectrum, and weak thermal contrast between snow and cloud in the thermal infrared spectrum. In recent years, more attention has been given to the problem of identifying clouds in arctic regions. An investigation of operational cloud analysis programs for arctic regions has been initiated; results from this study have shown that clouds are often specified in regions which turn out to be generally cloud-free and vice versa. Some possible reasons for this error will be presented. Results of discriminating clouds from a snow background using multi spectral visible and near Infrared sensors will also be given. A new Special Sensor Microwave/Imager (SSM/I) operating at four frequencies from 19 to 85 GHz is designed to provide estimates of several surface and atmospheric characteristics. Several parameters which will be estimated from SSM/I data are of particular interest to arctic regions. These include snow parameters, sea ice attributes, cloud amount over snow, cloud liquid water content, soil moisture, and land surface temperature.

N87-23558\*# Geological Survey, Flagstaff, Ariz.
ENHANCED LANDSAT IMAGES OF ANTARCTICA AND PLANETARY EXPLORATION

B. K. LUCCHITTA, J. A. BOWELL, K. EDWARDS, E. M. ELIASON, and H. M. FERGUSON *In* NASA, Washington Reports of Planetary Geology and Geophysics Program, 1986 p 554 May 1987 Submitted for publication

Avail: NTIS HC A24/MF A01 CSCL 08B

Since early in the LANDSAT program, black-and-white paper prints of band 7 (near infrared) of the LANDSAT multispectral scanner have been used extensively to prepare semicontrolled maps of Antarctica. Image-processing techniques are now employed to enhance fine detail and to make controlled image-mosaic maps in color. LANDSAT multispectral images of Antarctica help to expand our knowledge of extraterrestrial bodies by showing bare-ice areas as bright blue patches; on such patches meteorites tend to be concentrated and are collected. Many subtle flow features in Antarctic ice streams resemble features at the mouths of Martian outflow channels, which suggests that the channels also contained ice. Furthermore, flow lines in Antarctic ice sheets that merge with ice shelves resemble Martian flow features associated with dissected terrain along the Martian northern highland margin, and support the concept that ice was involved in the transport of material from the southern highlands to the northern lowland plains. In Antarctica, as on Mars, the virtual absence of fluvial activity over millions of years has permitted the growth of glacial and eolian features to unusually large sizes.

Author

N87-24734# Defense Mapping Agency Aerospace Center, St. Louis, Mo.

PRELIMINARY RESULTS OBTAINED BY DMAAC FROM THE PROCESSING OF A LIMITED SET OF GEOSAT SATELLITE RADAR ALTIMETER DATA

DENNIS H. VANHEE 19 Nov. 1986 15 p (AD-A179081) Avail: NTIS HC A02/MF A01 CSCL 17I

Details of the activities associated with the processing of GEOSAT satellite radar altimetry data are discussed. Summary statistics and observations obtained during the processing of a limited set of GEOSAT altimeter data are presented. Statistics from comparisons of GEOSAT-derived mean gravity anomalies with those obtained from available survey data are shown. Future plans and directions for the continued processing and exploitations of this data are indicated.

GRA

N87-24738# European Space Agency, Paris (France).
PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON PROGRESS IN IMAGING SENSORS

B. BATTRICK, ed. and E. J. ROLFE, ed. Nov. 1986 663 p. In ENGLISH, FRENCH, and GERMAN Proceedings held in Stuttgart, West Germany, 1-5 Sep. 1985; sponsored by the International Society for Photogrammetry and Remote Sensing, the Deutsche Gesellschaft fuer Photogrammetrie und Fernerkundung, DGLR, ESA, and DFVLR Submitted for publication. Original contains color illustrations

(ESA-SP-252; ISSN-0379-6566; ETN-87-99861) Avail: NTIS HC A99/MF A01

The complete proceedings of the symposium are presented. Some topics of interest were: Remote sensing image quality; camera calibration; optical data from space; sensor orientation and navigation; microwave data; and imaging spectrometers. Also discussed were: Aerial photography; microwave sensors; acquisition and use of space photographic data; and photogrammetry.

ESA

N67-24739\*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### EARTH SURFACE SENSING IN THE '90'S

CHARLES ELACHI In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 1-11 Nov. 1986 Original document contains color illustrations Sponsored by NASA

Avail: NTIS HC A99/MF A01 CSCL 08B

Advances in Earth sensor technology and data handling techniques are reviewed. These will allow the acquisition of high resolution images over a wide range of the electromagnetic spectrum (from microwave to optical) with sufficient spectral resolution to permit detailed analysis of the surface chemical, thermal, and physical properties. When combined with the topography, this will allow the user to analyze the full data set in a perspective view that enhances interpretation capability. ESA

N87-24740# Stuttgart Univ. (West Germany). Inst. for Navigation.

SMART SENSORS: AN OVERVIEW AND SELECTED EXAMPLES

M. J. NAHVI and PH. HARTL *In* ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 13-22 Nov. 1986

Avail: NTIS HC A99/MF A01

Smart sensors are reviewed and three conceptual levels are recognized, defining a functional hierarchy: data improvement, to increase accuracy; information extraction, to reduce data rate, and decision, to produce autonomy. Applications in measurement, control, remote sensing, and autonomous systems are illustrated, and advantages are quantified. Onboard processing for data reduction and autonomy is the trend in remote sensing and space missions, requiring intelligence, a knowledge base, and models of the external world. The role of smart sensors in an intelligent system is discussed and the extent of its operation is defined. Parallels with living compound lens and eye are observed.

N87-24742# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).

OPTICAL TRANSFER FUNCTION (OTF)-BASED QUALITY CRITERIA FOR AERIAL CAMERAS AND IMAGING SYSTEMS K.-J. ROSENBRUCH In ESA Proceedings of the International

Symposium on Progress in Imaging Sensors p 33-37 Nov 1986

Avail: NTIS HC A99/MF A01

It is demonstrated how for optical systems and imaging sensors, the optical transfer function can be reduced and used in practical application. For an image quality criterion (IQC) and data reduction, instead of the modulation transfer function (MTF) curve, the integral value is a reasonable data reduction. This integral should be extended up to the intersecting point of the total MTF curve of the receiver. If a correlation between quality numbers and the subjective impression of photographs is required, the just recognizable quality steps are proportional to the logarithm of a given integral. For the evaluation of the information content and digital image processing, the total MTF and relevant threshold modulation curves are important but not the integrals or log of integrals. The kind of object or its spatial frequency spectrum is not to be taken into account in an IQC evaluation.

N87-24743# National Research Council of Canada, Ottawa (Ontario). Photogrammetric Research Section.

### THOUGHTS ON A STANDARD ALGORITHM FOR CAMERA CALIBRATION

HARTMUT ZIEMANN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 41-48 Nov. 1986

Avail: NTIS HC A99/MF A01

Starting from concerns related to the calibration of aerial cameras, aspects of standardization of camera calibration procedures are discussed. These include standardization activities and a possible role of the International Society for Photogrammetry and Remote Sensing in such activities, a definition of the term

camera calibration, and a mathematical model and an algorithm for camera calibration. The mathematical model includes special considerations for cameras with adjustable focus.

N87-24744# Xian Research Inst. of Surveying and Mapping (China).

### APPLIED FORMULAE FOR CALIBRATION OF AERIAL PHOTOGRAMMETRIC CAMERAS

WANG YUWEI In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 49-54 Nov. 1986

Avail: NTIS HC A99/MF A01

Formulas for calibrating the inner orientation of aerial photogrammetric cameras, and to estimate its accuracy are given. The calculation accuracy is enhanced in determining principal point position and focal length by iteration in which the influences of distortion and scale line errors of calibration plate are taken into consideration. There are no restrictions on scale line errors of calibration plate. Theoretically, any calibration plates with low accuracy of scale lines in terms of nominal sizes can be used, if they are calibrated accurately. The obtained principal point and focal length agree with those in the literature. Their values are the weighted averages of those determined by pairs of points on the axes of image plane, so that photogrammetric accuracy benefits from the application of the parameters. Each calculated parameter has its own error estimate.

N87-24745# Bonn Univ. (West Germany). Inst. of Photogrammetry.

### GEOMETRICAL SYSTEM CALIBRATION, ESPECIALLY FOR METRIC AERIAL CAMERAS

G. KUPFER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 55-62 Nov. 1986

Avail: NTIS HC A99/MF A01

Geometrical system calibration is defined and its history is reviewed. Practical considerations and desirable capabilities of a calibration algorithm are discussed. Problems of full and partial system calibration are shown and recommendations for geometrical system calibration are given. Possibilities of the procedure are shown by examples.

N87-24746# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

## COMPARATIVE ANALYSIS OF THEMATIC MAPPER AND SPOT IMAGE DATA FOR LAND USE INVESTIGATION

W. KIRCHHOF, W. MAUSER, and H. J. STIBIG In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 65-71 Nov. 1986 Prepared in cooperation with Freiburg Univ.(West Germany). Original document contains color illustrations

Avail: NTIS HC A99/MF A01

Data records including 10, 20, 30, 50, and 80 m pixels from a Thematic Mapper (TM) simulation were analyzed regarding information content. Discrimination of objects, structures, and textures as a function of pixel size and combination of spectral bands is investigated by visual interpretation and supervised classification for applications in agriculture and forestry. New TM bands bring extensive improvement in separating areas of vegetation and built-up areas and in delimiting growth and moisture states. The TM is suited for extracting thematic information of surface areas of 1 hectare or more, 3 to 4 spectral bands are normally sufficient. The information content of the 20 m SPOT multiband data does not differ from that of comparable TM bands (TM2, TM3, TM4). Structural and textural contents of the panchromatic 10 m SPOT band form a substantial complement to the TM information. **ESA** 

N87-24748# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

APPLICATION OF MODULAR OPTOELECTRONIC MULTISPECT-RAL SCANNER (MOMS) DATA TO HYDROLOGY AND VEGETA-TION STUDIES. TEST SITE: PANTANAL REGION (BRAZIL/ PARAGUAY)

HERMANN J. H. KUX, MARTIN HAUCK, and KONRAD HILLER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 87-90 Nov. 1986 Prepared in cooperation with Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)

Avail: NTIS HC A99/MF A01

A section of Brazil/Paraguay/Bolivia imaged by MOMS was digitally classified and merged with a Thematic Mapper scene from the same region. A test of consistency and correctness was applied to the digital classifications of both sensors using kappa (k) statistics. Considering that the k value obtained is very low (0.1202), there is no agreement between the results of MOMS and TM classifications. The classification matrix shows a high confusion among the classes dense vegetation and wetlands. Areas covered by dense vegetation were interspersed with and/or overlayed with areas of wetlands with different water content. This great variation of soil moisture seems to be the principal environmental factor responsible for the high confusion found in these thematic classes.

N87-24749# Stuttgart Univ. (West Germany).
THE USE OF CAMERA ORIENTATION

THE USE OF CAMERA ORIENTATION DATA IN PHOTOGRAMMETRY: A REVIEW

FRIEDRICH ACKERMANN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 93-99 Nov. 1986

Avail: NTIS HC A99/MF A01

It is shown that precise camera orientation data obtained from flight navigation systems are of greatest importance to aerial photogrammetry, with regard to geometrical accuracy and economy. The first application of navigation systems concerns real time flight navigation and pinpoint photography to obtain regular overlap. The requirements can be met by any high precision navigation system. The most immediate use of recorded and postprocessed orientation data is in combination with aerial triangulation which would become practically independent of ground control points. Only position data are needed. The accuracy requirements are high but can potentially be met by GPS phase measurements. The accuracy requirements for direct setting of orientation parameters of photographs or pairs of photographs, avoiding aerial triangulation of reference to ground control, are extremely high and cannot yet be met by navigation systems.

N87-24750# Stuttgart Univ. (West Germany).

THE EFFECTS OF CAMERA POSITION AND ATTITUDE DATA IN AERIAL TRIANGULATION, A SIMULATION STUDY

PETER FRIESS *In* ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 101-111 Nov. 1986

Avail: NTIS HC A99/MF A01

Accuracy attainable in aerial triangulation using navigation data in joint block adjustment was studied in simulations. The influence of camera position data on the accuracy of photogrammetric blocks is considerable. They always allow reduction of control to the minimum case with four ground control points in the corners of the block. Camera position coordinates observed with low accuracy (10 m) allow aerial triangulation with minimum ground control and provide ground point position accuracies which could otherwise only be reached with quite dense ground control. Precise attitude data combined with camera position data provide an additional improvement of block adjustment. The use of precise measured rotations alone combined with sparse ground control (two control point chains) is also possible.

N87-24751# National Aerospace Lab., Amsterdam (Netherlands).

A MODULAR AND VERSATILE ACQUISITION, RECORDING AND PREPROCESSING SYSTEM FOR AIRBORNE REMOTE SENSING

H. POUWELS and Ł. J. AARTMAN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 113-121 Nov. 1986

Avail: NTIS HC A99/MF A01

An aircraft which can be equipped with either a SLAR, a multispectral scanner, or a TV-based scanner is described. The airborne recording equipment is designed to accommodate these various sensors. The general airborne system setup is: the sensor, a dedicated digitizing unit, and an interface to a high density digital tape recorder. Aircraft parameters like position, attitude, and time are recorded on the same tape. Flight tapes are replayed on existing equipment as used for PCM encoded telemetry data; only a high bit rate decoding unit is added. Raw remote sensing data and flight data are transfered to computer tapes. The software system Preprocessing Airborne Remote Sensing performs radiometric and geometric corrections for aircraft motion and for sensor characteristics.

N87-24752# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Inst. for Optoelectronics.

INFRARED EARTH HORIZON SENSOR CONCEPTS IN VARIOUS SPECTRAL BANDS

SIEGFRIED CRAUBNER and RUDOLF RICHTER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 123-127 Nov. 1986

Avail: NTIS HC A99/MF A01

Concepts for infrared Earth horizon sensors operating in different spectral bands are presented. Besides the 14 to 16 micron CO2 band currently used, the 9.4 to 9.8 micron ozone band and the 20 to 22 micron water vapor band are suitable for horizon detection. Measurements in the ozone band would allow a smaller optics aperture than in the CO2 band. The advantage of the water vapor band is a horizon nearer to the Earth's rim and a lower variation of the horizon radiance profile for the different standard bolometers or pyroelectric detectors, the signal to noise ratio in the bands 9.4 to 9.8, 14 to 16, and 20 to 22 microns can be made sufficient. Thus there is no need to use cooled detectors in this application.

N87-24755# Marconi Co. Ltd., Great Baddow (England).
THE EFFECT OF RECEIVER AMPLIFIER NON-LINEARITY ON
ERS-1 SYNTHETIC APERTURE RADAR IMAGERY

J. J. W. WILSON *In* ESA Proceedings of the International Symposium of Progress in Imaging Sensors p 149-155 Nov. 1986 Sponsored by ESA

Avail: NTIS HC A99/MF A01

The effect of a nonlinear active microwave instrument (AMI) receiver system gain characteristic on ERS-1 synthetic aperture radar imagery is assessed by feeding the signal from a point target on a distributed target background together with thermal noise into the receiver system. The output from the receiver system is then subjected to range and azimuth compression in order to generate the image intensity at the point in the image corresponding to the peak of the point target response function. The impact of nonlinearity and saturation in the AMI receiver system transfer characteristic are assessed by comparing the image intensity arising from passing the input signal through the AMI receiver system with the image intensity arising from passing the same input through a similar but completely linear receiver system.

N87-24756\*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### RADIOMETRIC CALIBRATION OF THE SHUTTLE IMAGING RADAR (SIR-C) SYSTEM

JOHN C. CURLANDER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 157-160 Nov. 1986 Sponsored by NASA

Avail: NTIS HC A99/MF A01 CSCL 17E

The radiometric calibration accuracy of the Shuttle Imaging Radar (SIR-C) sensor is discussed. The analysis includes the antenna, RF electronics, the digital data handling system, the platform attitude control, attitude determination accuracy, and orbit effects. The radiometric distortion of the image products by the ground processing system used for the image formation is also considered. Since the SIR-C system is a dual-frequency quad-polarized system (i.e., 8 channels), the amplitude and phase error is considered over all possible operating modes and environments for absolute and relative (long-term and short-term) calibration within a channel and across channels.

N87-24757# National Research Council of Canada, Ottawa (Ontario). Photogrammetric Research Div. of Physics.
PROPOSED CHANGES TO THE CANADIAN CAMERA CALIBRATION REPORT

H. ZIEMANN, M. L. LANDREVILLE, and J. E. W. PLUMMER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 163-169 Nov. 1986

Avail: NTIS HC A99/MF A01

The requirements for an aerial survey camera are discussed, and Canadian camera calibration reports are reviewed. The reports are based on the requirements stated in the Canadian federal Specification for Aerial Survey Photography; changes in the Specification resulted at a number of times in changes to the calibration report. A large number of items included at one time or another are explained. A proposal indicating which items should be retained during a major revision of the calibration report, and

which new items should be added, is made.

N87-24761# Institut Geographique National, Paris (France).

APPLICATIONS OF LASER AIRBORNE TELEMETRY AT INSTITUT GEOGRAPHIQUE NATIONAL (IGN), FRANCE

R. BROSSIER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 193-199 Nov. 1986

Avail: NTIS HC A99/MF A01

An airborne system on pressurized aircraft for the determination of ground profiles to provide an altimetric network for small scale photogrammetric surveys was developed. The system includes a laser telemeter for measuring the distance between aircraft and ground, and a pressure sensor for obtaining an isobaric reference. From this initial version, a system was developed to synchronize laser emission with photograph exposures. Another application concerns determination of ground profiles in wooded areas, which implies a modification of laser reception, for receiving all the echos coming from the ground. The ground profile itself is determined by sampling of the data.

N87-24763# Stuttgart Univ. (West Germany). Inst. for Navigation.

## APPLICATION OF GLOBAL POSITIONING SYSTEM (GPS) RECEIVERS FOR EARTH OBSERVATION

PH. HARTL and W. SCHOELLER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 207-214 Nov. 1986

Avail: NTIS HC A99/MF A01

Use of the Global Positioning System (GPS) to acquire navigational information is proposed. The extremely high relative accuracy of a few dm over several hundred kilometers can be achieved in positioning, if the carrier phase measurement is applied in connection with the differential mode. The carrier phase signals can be used for attitude measurements. Here an interferometer system must be used, which consists of at least three antennas and corresponding receivers. They must constitute a pair of orthogonal interferometers. Relative accuracies on the order of

fractions of a degree down to several arcseconds might be achieved.

N87-24765# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).

### DEFINITION OF A THERMAL INFRARED PUSHBROOM IMAGER FOR EARTH OBSERVATION

M. RAST, M. L. REYNOLDS, and P. HOLLIER (MATRA Espace, Toulouse, France) In its Proceedings of the International Symposium on Progress in Imaging Sensors p 229-234 Nov. 1986

Avail: NTIS HC A99/MF A01

The feasibility of a thermal IR pushbroom camera design to satisfy the high resolution, multispectral imaging requirement corresponding to Earth observation mission objectives was assessed. In view of the state of the art, it seems that such an instrument is feasible within the next decade. According to a scientific and user requirement inquiry, the suggested ground resolution of 30 m could be reduced to 50 m while maintaining the main mission objectives and requirements. This reduction would relax the technical and cost problems for a spaceborne instrument. For example, it is estimated that the mass would reduce from 320 kg to 120 kg and diminish the maximum dimensions from 3.0 m to 1.7 m due to an entrance aperture reduction from 500 mm to 250 mm.

N87-24767# Canada Centre for Remote Sensing, Ottawa (Ontario).

# THE MULTIDETECTOR ELECTRO-OPTICAL IMAGING SENSOR (MEIS) 2 PUSHBROOM IMAGER: FOUR YEARS OF OPERATION

S. M. TILL, R. A. NEVILLE, W. D. MCCOLL, and R. P. GAUTHIER *In* ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 247-253 Nov. 1986 Avail: NTIS HC A99/MF A01

A linear array multispectral airborne imager was designed to provide remote sensing data with improved radiometric and geometric characteristics, and with spectral selectivity for specific applications. Four years of operation, acquiring digital imagery for 50 airborne missions per year, provided unique data from this state-of-the-art imager, for application research and for sensor evaluation. Ongoing sensor development includes optics for continuous fore-aft stereo data acquisition, calibrated narrow band (3 nm) spectral filter sets, integration of downwelling irradiance and radiance spectral data, interference filters free from spectral blue shift, and an automated laboratory calibration facility.

N87-24768# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

### THE STEREO PUSHBROOM SCANNER SYSTEM DIGITAL PHOTOGRAMMETRY SYSTEM (DPS) AND ITS ACCURACY

OTTO HOFMANN *In* ESA Proceedings of the International Symposium on Progress in Imagery Sensors p 257-264 Nov. 1986 Previously announced as N87-17167

Avail: NTIS HC A99/MF A01

A digital stereoscanner with three line sensor arrays working on the pushbroom principle and a suitable rigorous compilation process, was designed. It delivers the orientation data of the camera in selectable update points along the flight path of aircraft, spacecraft, or missiles, the three-dimensional coordinates of the digital elevation model, ortho and stereo-orthophotos, digital elements for line maps and rectified multispectral images. By computer simulated operational models the influence of the camera and flight parameters on the accuracy of the models was tested.

ES/

N87-24769# Technische Univ., Hanover (West Germany). Inst. for Photogrammetry and Engineering Surveys.

AERIAL TRIANGULATION OF CCD LINE-SCANNER IMAGES

E. KRUCK and P. LOHMANN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 265-270 Nov. 1986

Avail: NTIS HC A99/MF A01

A method for the evaluation of CCD line scanner imagery is presented. The mathematical formulation considers central perspective geometry within a single line and allows easy implementation on analytical photogrammetric systems. The adjustment allows the use of additional frame camera images as well as other measurements. An anchor point file for the generation of orthophotos may be generated whenever digital terrain model data are available. Results using a combined adjustment of Spacelab Metric Camera photographs and MOMS data are presented.

N87-24771# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany) INVESTIGATION OF SIMULATED MONOCULAR ELECTRO-OPTI-CAL STEREO SCANNER (MEOSS)-IMAGERY FOR SENSOR NAVI-**GATION AND TERRAIN DERIVATION** 

J. WU In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 279-284 Nov. 1986 Avail: NTIS HC A99/MF A01

Rectification of Monocular Electro-Optical Stereo Scanner images for distortions due to perturbations of position and attitude parameters and elevation differences in the terrain is discussed. Analytical photogrammetry is applied to evaluations of the stereoscopic image data. Primary results are the sensor orientation and the terrain model. The digital image processing system includes a photogrammetric aerial triangulation program based on collinearity conditions and weight constraints. Numerical simulation reveals the potential usage of such a sensor system concerning sensor navigation and terrain derivation.

Xian Research Inst. of Surveying and Mapping N87-24773# (China).

#### MATCHING OF RESOLUTION IN AERIAL **PHOTOGRAPHIC SYSTEMS**

JUNLIANG CAI and HUIPING CHEN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 295-302 Nov. 1986

Avail: NTIS HC A99/MF A01

Matching of lens and film resolutions and image motion is discussed. A matching when the resolution of film is 3 to 4 times higher than that of lens with the image motion less than 2/3 to 3/4 of line pair width of static resolution is best. In order to improve the dynamic resolution, it is more effective to limit the image motion than to improve the static resolution. Therefore, the use of image motion compensation is necessary. In this case, the static resolution 3 to 4 times higher than the resolution corresponding to residual image motion is preferable.

N87-24775# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

### **EXPOSURE TEST WITH HIGH RESOLUTION FILMS FROM HIGH**

M. SCHROEDER and C. DUDA In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 311-316 Nov. 1986

Avail: NTIS HC A99/MF A01

High altitude (10 km) aerial photographs on high resolution films (3412 b/w); SO-131 (CIR); SO-242 (Co) taken at various illumination conditions and with different exposure settings were analyzed by densitometric measurements in order to find the influence of exposure and illumination on film density. From these measurements, formulas for exposure settings as function of the Sun elevation were derived.

N87-24776# Firma Maps G.m.b.H., Munich (West Germany). VERY HIGH RESOLUTION AERIAL FILMS

In ESA Proceedings of the International ROLF BECKER Symposium on Progress in Imaging Sensors p 317-326

Avail: NTIS HC A99/MF A01

The use of very high resolution aerial films in aerial photography is evaluated. Commonly used panchromatic, color, and CIR films and their high resolution equivalents are compared. Based on practical experience and systematic investigations, the very high image quality and improved height accuracy that can be achieved using these films are demonstrated. Advantages to be gained from this improvement and operational restrictions encountered when using high resolution film are discussed.

N87-24781# Zeiss (Carl), Oberkochen (West Germany). THE RMK AERIAL CAMERA SYSTEM: PERFORMANCE POTENTIAL OF AERIAL PHOTOGRAPHY WITH FORWARD **MOTION COMPENSATION** 

W. LORCH In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 363-366 Nov. 1986 Avail: NTIS HC A99/MF A01

It is shown that the use of forward motion compensation (FMC) in aerial survey cameras increases the image quality significantly. Medium-resolution films are mostly being used with FMC. Another considerable image quality increase can be achieved by the use of high-resolution films which were not very suited for large-scale photography because of their high contrast. Performance is optimum with the lens stepped down 1 stop. Experience shows that an adverse residual image motion due to unfavorable external influences does not occur if exposure times of 1/300 sec or less

N87-24782# Wild Heerbrugg Ltd. (Switzerland). WILD AVIOPHOT (TM) RC20 AERIAL CAMERA SYSTEM. THE OTHER APPROACH TO IMAGE MOTION COMPENSATION IN **AERIAL PHOTOGRAPHY** 

ARTHUR ROHRBACH and ROLAND SCHLIENGER Proceedings of the International Symposium on Progress in Imaging Sensors p 367-373 Nov. 1986 Avail: NTIS HC A99/MF A01

It is shown that the integration of forward motion compensation (FMC) in the Wild Aviophot RC20 aerial camera system, allows a better exploitation of the high inherent optical performance of the Wild lenses. The main practical benefits are: an increase in image quality and resolution when combining the FMC device of the EC20 with high-resolution emulsions; as well as a better use and exploitation of the standard film types, in connection with large-scale and very-large-scale photographs, under less than ideal light conditions (low light-level). Given the high investment and running costs involved in aerial photography, features like an increase in image resolution, additional flying hours, high product reliability, and flexible connection to aircraft navigation systems are highly significant for overall mapping economy.

N87-24785# Technische Univ., Berlin (West Germany). Dept. of Photogrammetry and Cartography. **CLOSE-RANGE** 

DIGITAL DATA **ACQUISITION FOR PHOTOGRAMMETRY** 

JOERG ALBERTZ and ALFRED MEHLBREUER Proceedings of the International Symposium on Progress in Imaging Sensors p 385-390 Nov. 1986 Avail: NTIS HC A99/MF A01

A digital close-range photogrammetric data acquisition system, suitable for mobile operation and designed to take stereo-images simultaneously is presented. A proposal is made for a high resolution digital acquisition system. By this approach the limited geometrical resolution of CCD-arrays can be improved. Applications with a scanning electron microscope are shown. **ESA** 

N87-24788# Technische Univ., Dresden (East Germany). Dept. of Geodesy and Cartography.

THE PRODUCTION OF PHOTOGRAPHS OF THE EARTH'S SURFACE TAKEN FROM SATELLITES AND THEIR APPLICATION IN MAP PRODUCTION AND MAP REVISION

KLAUS SZANGOLIES In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 411-413 Nov. 1986

Avail: NTIS HC A99/MF A01

It is shown that photographs taken from space by a camera with 6 spectral channels meet the requirements of most mapping tasks at the scales 1:50,000 to 1:200,000 (and smaller) with regard to the interpretation capability and the geometric accuracy. Advantages compared with the large format aerial cameras lie in the fact that photographs of six different spectral channels are simultaneously obtained, and that the resolving power of the single cameras is considerably higher because of the narrow spectral ranges.

N87-24789# Technische Univ., Munich (West Germany). Inst. fuer Geographie.

LARGE FORMAT CAMERA IMAGE ANALYSIS FOR MAPPING OF LAND USE PATTERNS IN THE REGION NOALE - MUSONE, PO-RIVER-PLAIN, NORTH ITALY

H.-G. GIERLOFF-ÉMDEN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 415-426 Nov. 1986

Avail: NTIS HC A99/MF A01

Large Format Camera (LFC)-photography was analyzed to test the applicability of LFC-photographs for topographic and thematic maps. Scales of 1:100,000, 1:50,000 and 1:25,000 were assessed concerning the information and the interpretability of the object-categories, point-shape, line-shape, plane-shape, and the objects in the real world and the discreet signatures in the maps. The minimum visible is analyzed according to ground truth in the test areas. Stereoscopic techniques are not used. Results show that LFC-photography is qualified for topographic maps on the scale of 1:100,000 and 1:50,000 (selected purpose) and for thematic maps up to the scale of 1:25,000 for land use pattern and land surface features.

N87-24792# Ludwig-Maximilians-Universitaet, Munich (West Germany). Inst. fuer Geographie.

LARGE FORMAT CAMERA PHOTOGRAPHS OF THE BLACK HILLS, USA, AND THEIR SUITABILITY FOR TOPOGRAPHIC AND THEMATIC MAPPING

KLAUR R. DIETZ In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 439-448 Nov. 1986 In GERMAN; ENGLISH summary

Avail: NTIS HC A99/MF A01

Large Format Camera (LCF) photos of the Black Hills, taken on Space Shuttle Mission 41-G, were compared with Metric Camera (MC) photos from the same area, as well as with maps and with high altitude photos. The use of high resolution film, forward motion compensation, and better illumination conditions and base height ratios of the LFC photos give a distinct improvement compared to the MC data. The LFC images seem suitable for mapping on the scale of 1:100,000, if supported by field work. Due to the moderate image quality provided by the EROS Data Center, the production of maps on the scale of 1:50,000 does not seem possible.

N87-24798# National Research Council of Canada, Ottawa (Ontario). Photogrammetric Research Div. of Physics.

SPECTROPHOTOMETRIC MEASUREMENTS ON COLOR AERIAL PHOTOGRAPHS

H. ZIEMANN, J. C. CROTEAU, J. R. HANDY, and E. NAGY In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 491-503 Nov. 1986

Avail: NTIS HC A99/MF A01

It is shown that a microdensitometer can be calibrated to carry out spectrophotometric measurements on aerial photographs. In spite of several approximations necessary to extend the measured PDS 1010M data to the full photometric range and to use available integration tables for the CIE color-matching functions, the results appear to be accurate enough to indicate known characteristics of the used color-emulsions. The used experimental color panels were rather small resulting in relatively noisy PDS 1010M measurements; more accurate results would be obtained with larger panels. The saturation for the used panels is small; higher saturation would be desirable. Results indicate that color panels of the same quality and size as the available neutral density (ND) reflectance panels are desirable for further test photography; color panels provide additional information about the response of color emulsions not available from the ND reflectance panels.

N87-24811# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. for Optoelectronics.

### EARTH OBSERVATION EXPERIMENTS ON THE GERMAN SPACELAB MISSION D2

F. LANZL /n ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 609-616 Nov. 1986
Avail: NTIS HC A99/MF A01

The Spacelab D2 remote sensing mission applications and equipment are summarized. The Mapping Experiment from Space involves topographic and thematic mapping with an improved Metric Camera. Modular Optoelectronic Multispectral Scanner 2 studies correlation of multispectral and terrain information. The Spacelab Atmospheric Lidar Experiment is designed for determination of atmospheric data for weather forecasts.

N87-24812# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. for Optoelectronics.

### THE MONOCULAR ELECTRO-OPTICAL STEREO SCANNER (MEOSS) SATELLITE EXPERIMENT

F. LANZL In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 617-620 Nov. 1986
Avail: NTIS HC A99/MF A01

An along track spaceborne threefold scanner flight on the SROSS satellite is introduced. It includes investigation and test of different evaluation methods for threefold stereo scan systems for the planning of future higher resolution systems, and angular dependent reflectance information and frequent coverage of same test area. Applications include meteorology, mapping, environmental monitoring, and geological and forestry surveys.

ESA

N87-24813# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. for Optoelectronics.

### MODERN CCD SENSORS AND THEIR APPLICATIONS IN EARTH OBSERVATION AND PLANETARY MISSIONS

P. SEIGE In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 621-625 Nov. 1986

Avail: NTIS HC A99/MF A01

The characteristics of CCD's are listed. Trends in CCD technology are outlined.  $\hfill \ensuremath{\mathsf{ESA}}$ 

N87-24815# Technische Univ., Munich (West Germany). Faculty of Geosciences.

THE MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS) PROGRAM OF THE BUNDESMINISTERIUM FUER FORSCHUNG UND TECHNOLOGIE (BMFT). MILESTONES IN THE DEVELOPMENT OF AN OPERATIONAL EARTH OBSERVATION SYSTEM

J. BODECHTEL, D. MEISSNER, P. SEIGE, H. WINKENBACH (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen, West Germany), and J. ZILGER In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 635-639 Nov. 1986

Avail: NTIS HC A99/MF A01

The mission of the Modular Optoelectronic Multispectral Scanner (MOMS) aboard two flights of the Space Transportation System demonstrated the feasibility of the concept with regard to technical and scientific objectives. On account of the successful

missions a cooperation was agreed for comparing MOMS observations with operational Landsat-Thematic Mapper data over selected test sites as a means of obtaining relative measure of performance. The results obtained and aspects of MOMS instrument development aiming at the realization of an operational system are presented.

### 09

### **GENERAL**

Includes economic analysis.

#### A87-32502

### UNITED STATES REMOTE SENSING SATELLITES (RSSS) PAST, PRESENT, AND FUTURE

LOUIS GOMBERG (RCA, Astro-Electronics Div., Princeton, NJ) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1677-1688.

The current operational remote sensing satellite programs in the United States are described. These include the DMSP, supplying the Armed Forces with meteorological and other environmental data; the TIROS system, which is the civilian analog of the PMSP, and is the original remote sensing satellite; the GOES, which provides NOAA with large-area cloud-cover data and wind direction; and the Landsat system, used to evaluate and manage earth resources. The salient features of the satellites in each system, the sensors carried, and the new developments introduced into these systems are presented. The Naval Remote Ocean Sensing Satellite being planned by the U.S. Navy for development is briefly discussed.

### A87-32955

### INDIAN REMOTE SENSING PROGRAMME

B. L. DEEKSHATULU and S. ADIGA (National Remote Sensing Agency, Hyderabad, India) Geocarto International, no. 4, 1986, p. 49-59. refs

India's remote sensing program is reviewed. India has developed facilities for the design, development, and management of remote sensing satellites and sensors, the acquisition, processing, dissemination, and analysis of the data, and the training of users. The characteristics and capabilities of India's satellites, earth station, and platforms are described. Consideration is given to the Indian Remote Sensing Satellite (IRSS) mission, the National Natural Resources Management System, IRSS utilization projects, user training and education, and international remote sensing projects. India's remote sensing capabilities have been applied to the study of agriculture, soils, forestry, ecology/morphology, minerals, land use, hydrology, and urban planning. Specific examples of Indian remote sensing projects are provided.

### A87-33125

### **WORLD-WIDE WEATHER**

KOICHIRO TAKAHASHI, ED. Rotterdam and Accord, MA, A. A. Balkema, 1986, 263 p. Translation. No individual items are abstracted in this volume.

Various global meteorological phenomena are examined. Attention is placed on the changing world climate, solar energy and the world climate, the water of the world, and wind systems of the world. Consideration is given to seasonal winds, rain and drought in India and Pakistan, plum rains and the Tibetan Plateau, the climate of the Mediterranean region, coastal deserts, the arid zone of Brazil, tropical rain and the intertropical convergence zone, the changing water level of Lake Victoria, tropical cold waves, typhoons, cyclones, hurricanes, winter storms, bora and foehn, windspouts and tornadoes, blizzards, the weather of the South Pole, the weather of the North Pole and the Arctic cold wave, tundra, icefloes and icebergs, and the ice age. The effect of human

activity, in particular air pollution and aircraft routes, on the climate is discussed.

#### A87-34208

OPTIMIZATION OF A PROGRAM OF EXPERIMENTS IN CONNECTION WITH THE OPERATIONAL PLANNING OF STUDIES CARRIED OUT WITH A SPACECRAFT OPTIMIZATSIIA PROGRAMMY EKSPERIMENTOV PRI OPERATIVNOM PLANIROVANII ISSLEDOVANII, VYPOLNIAEMYKH S KA]

M. IU. BELIÄEV and D. N. RULEV Kosmicheskie Issledovariila (ISSN 0023-4206), vol. 25, Jan.-Feb. 1987, p. 30-36. In Russian. refs

An approach to the optimal planning of experiments for the Salyut orbital station is described. The problem of operational experiment planning is reduced to an integer problem of linear programming. A set of programs for the BESM-6 computer has been developed for implementing the proposed method. The remote sensing of earth resources is considered as an example.

#### B.J.

### A87-34600

# FRENCH SPOT AND THE U.S. LANDSAT JOCKEY FOR POSITION IN THE RACE FOR A MULTIMILLION-DOLLAR REMOTE SENSING MARKET

DAVID S. MEYER Commercial Space (ISSN 8756-4831), vol. 2, no. 4, Winter 1987, p. 62-66.

Spot and Landsat 4 and 5 images are the basis of an industry taking remote sensing technology to the market place. Landsat thematic mapper images are produced by combining data from bands in the visible and near infrared ranges of the electromagnetic spectrum; the images provide more information about vegetation than Spot images do. Overall detail, at only 30-m resolution, is lower than that provided by Spot, which can merge 20-m-resolution multispectral and 10-m-resolution panchromatic data. The data products (tapes and film) are used by companies and government agencies in such diverse areas as mapping, petroleum and mineral exploration, crop analysis, coastal studies, hydrology and hazardous waste monitoring. Eosat took over the operation of NASA Landsat satellites in 1985, but the agreed-on transitionary funding to cover five years has not been forthcoming from the U.S. government. A new Landsat cannot be launched until 1989 and there is a good chance that Eosat will have to buy Spot data from their competitor to supplement their data archive. Spot is a joint venture of the French CNES space agency with Sweden and Belgium. The Japanese, Canadians and ESA, meanwhile, are planning their own entries into the remote sensing data markets. The rapidly expanding personal computer industry, making image and data processing easier and cheaper, will lead the remote sensing industry to gross more than \$1 billion by the year 2000.

### A87-34799

### INTELSAT'S SMALL EARTH STATIONS - IMPACT ON THE DEVELOPING WORLD

PATRICK MCDOUGAL (Intelsat, Washington, DC) Space Communication and Broadcasting (ISSN 0167-9368), vol. 4, Dec. 1986, p. 455-462.

This article offers a brief historical look at the progress in the use of small earth stations in the developing world, and a present status report on Intelsat's new service offerings, especially in the use of smaller earth station technology. Three experiments or series of experiments are discussed: those conducted on NASA's ATS (Applications Technology Satellite) series of satellites, India's SITE (Satellite Instructional Television Experiment), and the Rural Satellite Project sponsored by the U.S. Agency for International Development. Intelsat's contributions to the growth of telecommunications in the developing world include: domestic leases, VISTA and INTELNET services, Project SHARE, and some new strategies for the financing of telecommunications projects. The article concludes that it is only recently that some of the true benefits of satellite communications have been realized in the developing countries because of improvements in technology, reduction in costs, and diversity of service offerings. Author

#### A87-41435

### THE APPLICATION OF REMOTE SENSING TECHNIQUES IN CHINA

SHI-REN YANG (Chinese Academy of Sciences, Institute of Remote Sensing Application, Beijing, People's Republic of International Journal of Remote Sensing (ISSN 0143-1161), vol. 8, April 1987, p. 651-658.

The current status of the application of remote sensing techniques in China is described. The Chinese Landsat ground station was recently put into operation, and more than thirty low and medium altitude aircraft for remote sensing applications are now operational. Digital image processing systems are now widely used in remote sensing applications, while new instruments and sensors have been developed and are now in use. Applications of remote sensing in China for land resource surveys, urban pollution detection and environmental monitoring, agriculture, forestry, hydrology, geology, coal mining, uranium exploration, glaciology and cryopedology are discussed.

N87-20626# Centre National d'Etudes Spatiales, Toulouse (France). SPOT IMAGE.

### REMOTE SENSING APPLICATIONS: COMMERCIAL ISSUES AND OPPORTUNITIES FOR SPACE STATION

G. BRACHET In ESA Proceedings of the European Symposium on Polar platform Opportunities and Instrumentation for Remote-sensing (ESPOIR) p 35-37 Nov. 1986

Avail: NTIS HC A07/MF A01

The SPOT program is reviewed and the long term prospects beyond SPOT-4 are assessed. Management, legal, and commercial aspects are emphasized.

### N87-24493# Joint Publications Research Service, Arlington, Va. ARIANESPACE TOP PERFORMANCE BENEFITS ESA

REIMAR LUEST In its Europe Report: Science and Technology p 2-5 19 Jun. 1986 Transl. into ENGLISH from Frankfurter Zeitung/Blick Durch die Wirtschaft (Frankfurt/Main, West Germany), 29 Apr. 1986 p 5 Avail: NTIS HC A08/MF A01

The economic exploitation of space is growing in importance. The achievements in telecommunication satellites are reviewed. There are also numerous practical applications of earth reconnaissance from space which are also of considerable significance economically. Examples of these are the monitoring of pollution, sea and coastal surveillance, geological reconnaissance, cartography, and weather forecasting. The exploitation of zero gravity could also be of increasing significance in the areas of materials research and process engineering; chemical processes; liquid and gas physics; pharmacology; and biosciences. The role of the Arianespace is discussed in terms of economic and political impact on Europe.

N87-24777# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

### THE FIRST ESA REMOTE SENSING SATELLITE (STATUS AND OUTLOOK)

HANS MARTIN BRAUN and ERICH H. VELTEN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 329-334 Nov. 1986

Avail: NTIS HC A99/MF A01

The ERS-1 satellite design and development status are outlined. Mission objectives concentrate on ocean monitoring for scientific and economic purposes. The core payload consists of the active microwave instrumentation containing a synthetic aperture radar and a microwave scatterometer, and a radar altimeter. Supplementary instruments are an along track scanning radiometer, a microwave sounder, a precise range and range rate experiment, and a laser retroreflector.

N87-24780# National Research Council of Canada, Ottawa (Ontario). Photogrammetric Research Section.

### THE ROLE OF GOVERNMENT SPECIFICATIONS IN AERIAL PHOTOGRAPHY

HARTMUT ZIEMANN In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 351-353 Nov. 1986

Avail: NTIS HC A99/MF A01

It is indicated that the introduction and periodic review of a Specification for Aerial Survey Photography is helpful in achieving a fairly high and consistent quality in the aerial photography acquired by contractors for the needs of the Canadian federal government by forcing good contractor performance and by occasionally requiring modifications to or the replacement of aerial survey cameras. The interaction between the Canadian regulating and controlling agency, the camera manufacturers, and contractors proves beneficial to all parties.

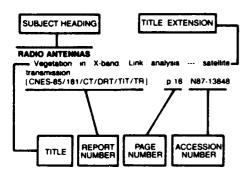
N87-24797# Tokyo Univ. (Japan). Inst. of Industrial Science. EARTH RESOURCES SATELLITE (ERS-1) PROJECT IN JAPAN SHUNJI MURAI In ESA Proceedings of the International Symposium on Progress in Imaging Sensors p 487-488 Nov.

Avail: NTIS HC A99/MF A01

The ERS-1 (Japanese spacecraft) sensor system including a synthetic aperture radar, four-band visible/near infrared CCD sensor with stereo mode and a four-band short wave infrared sensor (1.65, 2.10, 2.20 and 2.35 micrometers) is introduced. Applications include monitoring of natural resources as well as agriculture, forestry, fishery, environmental protection, natural disasters, and surveillance of coastal regions.

EARTH RESOURCES / A Continuing Bibliography (Issue 55)

### Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

### A

### **ABSORPTION SPECTROSCOPY**

Atmospheric environment monitoring system based on an earth-to-satellite Hadamard transform laser long-path absorption spectrometer - A proposal

p 45 A87-35502

### ACID RAIN

Spatial characterization of acid rain stress in Canadian Shield lakes p 36 N87-24031

[NASA-CR-180983]

Spatial characterization of acid rain stress in Canadian

INASA-CR-1809821

p 36 N87-24032

### **AERIAL PHOTOGRAPHY**

A comparison of optical bar, high-altitude, and black-and-white photography in land classification

p 4 A87-35122

Statistical evaluation of forest characteristics from aerial and space photographs p 5 A87-36109 Aerial and space investigations of soils and vegetation Russian book p 6 A87-36579

--- Russian book Aircraft radiopositioning for airborne photography during hydrographic coastal surveys p 23 A87-36945

An application of low altitude multispectral photography p 6 A87-37054 to agricultural field trials Testing the consistency for mapping urban vegetation

with high-altitude aerial photographs and Landsat MSS p 13 A87-37277 Aerotriangulation without ground control

p 46 A87-37289 Measurements on digitized hardcopy

p 39 A87-37290

Strategies and technologies for monitoring the p 14 A87-39593 environment Use of maps, aerial photographs, and other remote sensor data for practical evaluations of hazardous waste

p 14 A87-42255 Comparison between digital and manual interpretation of high altitude aerial photographs p 48 A87-42257

Proceedings of the International Symposium on Progress in Imaging Sensors

[ESA-SP-252] p 50 N87-24738 improvement of image quality by forward motion p 42 N87-24741 compensation, a preliminary report

Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems

p 51 N87-24742 Thoughts on a standard algorithm D 51 N87-24743 calibration Applied tormulae tor calibration aena photograminetric cameras p 51 N87-24744 Geometrical system calibration, especially for metric

p 51 N87-24745 aerial cameras The effects of camera position and attitude data in aeria triangulation, a simulation study p 52 N87-24750 Proposed changes to the Canadian camera calibration p 53 N87-24757

Applications of laser airborne telemetry at Institut Geographique National (IGN), France

p 53 N87-24761 On the matching of resolution in aerial photographic

Exposure test with high resolution films from high p 54 N87-24775 altitude Very high resolution aerial films p 54 N87-24776

The role of government specifications in aerial p 57 N87-24780 photography The RMK aerial camera system: Performance potential of aerial photography with forward motion compensation

p 54 N87-24781 Wild Aviophot (TM) RC20 aerial camera system. The other approach to image motion compensation in aerial p 54 N87-24782 photography

Spectrophotometric measurements on color aeria photographs p 55 N87-24798 Photographic quality of color IR aerial photos as a

function of atmospheric parameters p 42 N87-24799 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial p 12 N87-24801 photography The use of auxiliary date in

photogrammetric p 42 N87-24808 adjustments Image quality problems in practical aerial photograp p 43 N87-24814

### **AEROSOLS**

Sea surface temperature measurement from space allowing for the effect of the stratospheric aerosols p 22 A87-35148

Satellite sensing of aerosol absorption

p 47 A87-40770 Optical properties of the marine atmospheric boundary p 28 A87-42638 layer - Aerosol profiles AFRICA

The use of AVHRR data in operational agricultural assessment in Africa p 9 A87-40304 Real-time crop assessment using color theory and p 10 N87-20619

AGRICULTURE

Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, **Proceedings** p 1 A87-32007 Remote sensing research in global agricultural p 2 A87-32008 productivity Remote sensing methods of yield forecasting

p 2 A87-32009 The application of remote sensing in agricultural meteorology at the Meteorological Service of the HPR

p 2 A87-32010 The topographic effect on Landsat data in gently undulating terrain in southern Sweden p 4 A87-35307 An application of low attitude multispectral photography to agricultural field trials p 6 A87-37054

Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studi p8 A87-39187

Rice crop identification and area estimation using remotely-sensed data from Indian cropping patterns p 9 A87-41434

Foundations and applications of multispectral scanning [NLR-MP-85015-U] p 10 N87-21408

A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22260

The impact of climate change from increased mospheric carbon dioxide on American agriculture p 11 N87-23032 IDOE/NBB-00771

#### AGROCI IMATOLOGY

The use of AVHRR data in operational agricultural p 9 A87-40304

AGROMETEOROLOGY

The application of remote sensing in agricultural meteorology at the Meteorological Service of the HPR p 2 A87-32010

### AIR NAVIGATION

Aircraft radiopositioning for airborne photography during p 23 A87-36945 hydrographic coastal surveys of Global Positioning System (GPS) receivers for Earth observation p 53 N87-24763 AIR POLLUTION

Lidar observation of elevated pollution layers over Los p 13 A87-33292

A review of national and international activities on modeling the effects of increased CO2 concentrations on the simulation of regional crop production: A report on linkage between climate and crop models

[DE87-005994] p 10 N87-22336 Spatial characterization of acid rain stress in Canadian

[NASA-CR-180983] p 36 N87-24031 AIR QUALITY

Lidar observation of elevated pollution layers over Los p 13 A87-33292 AIR SEA ICE INTERACTIONS

Feedback between ice flow, barotropic flow, and baroclinic flow in the presence of bottom topograp

p 27 A87-40289 Remote sensing of the Fram Strait marginal ice zone p 27 A87-40433

Mesoscale oceanographic processes beneath the ice of Fram Strait p 28 A87-40434 Remote sensing as a research tool --- sea ice

surveillance from aircraft and spacecraft

p 28 A87-40648 An evaluation of the polar ice prediction system [AD-A176522] p 41 N87-23014

Arctic Sea ice, 1973-1976: Satellite passive-microwave observations

[NASA-SP-489] p 33 N87-24870

### AIR WATER INTERACTIONS

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz

p 22 A87-35515 Satellite measurements of sea surface cooling during p 24 A87-37886 hurricane Gloria

Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980

The 1982-1983 El Nino Atlas: Nimbus-7 microwave radiometer data [NASA-CR-180914] p 31 N87-22386

### AIRBORNE EQUIPMENT

Interpretation of the polarimetric co-polarization phase term in radar images obtained with the JPL airborne L-band SAR system p 36 A87-31412 Airborne observation experiments for MOS-1 verification

program (MVP) p 44 A87-32500 Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation --- Global Tropospheric on Test and p 45 A87-33426 Experiment/Chemical Instrumentation

Evaluation Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431 Carbon monoxide measurements over the eastern Pacific during GTE/CITE 1 --- Chemical Instrum p 21 A87-33435 Test and Evaluation Measurement of the spatial spectrum of ocean waves

using a two-frequency scatterometer p 23 A87-36107 Nadir looking airborne radar and possible applications p 7 A87-38095 to forestry

Airborne remote sensing of forest biomes

p 9 A87-40301 Ground and aerial use of an infrared video camera with

a mid-infrared filter (1.45 to 2.0 microns) p 48 A87-41588

The Multidetector Electro-optical imaging Sensor (MEIS) 2 pushbroom imager. Four years of operation

p 53 N87-24767

#### AIRBORNE LASERS

Wind and nadir angle effects on airborne lidar water p 29 A87-42641 'surface' returns

### AIRBORNE SURVEILLANCE RADAR

Strategies and technologies for monitoring the environment p 14 A87-39593 AIRBORNE/SPACEBORNE COMPUTERS

The integration of spectral and spatial analysis for land use classification IAD-A1787031 p 14 N87-23015

A modular and versatile acquisition, recording and preprocessing system for airborne remote sensing p 52 N87-24751

#### ALREDO

Recent research in snow hydrology

p 35 A87-40309

Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers

INASA-TP-26431 p 49 N87-22281 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of

DE87-0060591 p 41 N87-24011

### validity ALGORITHMS

Introduction of initial centers for the algorithm of clustering around mobile centers --- in multispectral image p 37 A87-35313 classification

Derivation of a fast algorithm to account for distortions due to terrain in earth-viewing satellite sensor images

p 38 A87-35524 Radiometric correction of SAR images - A new correction algorithm n 40 A87-39184

An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628 A technique to estimate the ocean surface energy flux p 30 N87-20710

using VAS multispectral data An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of

[DE87-006059] p 41 N87-24011 Thoughts on a standard algorithm for camera p 51 N87-24743 calibration

### ALPINE METEOROLOGY

Remotely sensed sea surface temperature for the Alpine Experiment (ALPEX) --- AVHRR-2 data

p 30 N87-21497

### ALPS MOUNTAINS (EUROPE)

Development of a satellite remote sensing technique for the study of alpine glaciers p 34 A87-35311 ALTIMETERS

Spectrasat instrument design using maximum heritage p 26 A87-38847

### ALTIMETRY

Applications of laser airborne telemetry at Institut Geographique National (IGN), France

p 53 N87-24761 AMAZON REGION (SOUTH AMERICA)

Trace gas exchanges and transports over the p 12 A87-32196 Amazonian rain forest AMPLIFICATION

The effect of receiver amplifier non-linearity on ERS-1 p 52 N87-24755 synthetic aperture radar imagery

### ANGULAR DISTRIBUTION

Modelling of atmospheric effects on the angular distribution of a backscattering peak

DE87-0060601 p 41 N87-24014

### **ANGULAR VELOCITY**

Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87-35314

### ANNUAL VARIATIONS

Remote-sensing method for determining monthly precipitation sums using Meteor-satellite data on the Atlantic Ocean p 21 A87-34447

Seasonal and regional variations of active/passive microwave signatures of sea ice p 22 A87-35516

Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence on microwave communications planning and rain-rate data acquisition p 46 A87-36933

Variations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097

Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p 39 A87-38098 Regional and seasonal variations of surface reflectance from satellite observations at 0.6 micron

p 27 A87-40250

The 1982-1983 El Nino Atlas Nimbus-7 microwave radiometer data

|NASA-CR-180914| p 31 N87-22386 Arctic Sea ice. 1973-1976 Satellite passive-microwave

p 33 N87-24870 INASA-SP-4891

#### ANOMALOUS TEMPERATURE ZONES

The impact of initial conditions and SST Anomalies on extended range predictions for the El Nino period --- sea p 32 N87-23046 surface temperature (SST)

#### **ANTARCTIC REGIONS** West Antarctic ice streams draining into the Ross Ice

Shelf Configuration and mass balance p 19 A87-31592

Recurring polynyas over the Cosmonaut Sea and the p 23 A87-37563 Maud Rise

Enhanced LANDSAT images of Antarctica and planetary p 50 N87-23558 exploration

Satellite techniques for studying ice crusts and underground waters in the eastern Pamir

p 35 A87-36106 ARCTIC OCEAN

Coastal zone color scanner imagery of phytoplankton pigment distribution in Icelandic waters n 29 A87-42645

An evaluation of the polar ice prediction system N87-23014 AD-A178522|

### **ARCTIC REGIONS**

Atmospheric remote sensing in arctic regions

AD-A179550| p 50 N87-23012 Arctic Sea ice, 1973-1976: Satellite passive-microwave observations

p 33 N87-24870 INASA-SP-4891 ARIANE LAUNCH VEHICLE

Arianespace top performance benefits ESA p 57 N87-24493

### ARTIFICIAL INTELLIGENCE

Smart sensors: An overview and selected examples p 51 N87-24740

#### **ASTROMETRY**

International Conference on Earth Rotation and the Terrestrial Reference Frame, Columbus, OH, July 31-Aug 2, 1985, Proceedings. Volumes 1 & 2

### p 15 A87-36126

ATLANTIC OCEAN Remote-sensing method for determining monthly precipitation sums using Meteor-satellite data on the p 21 A87-34447 Atlantic Ocean Long waves in the equatorial Atlantic Ocean during

p 23 A87-37564 Quick look Atlantic Ocean rain maps for gale

p 30 N87-21533 [NASA-CR-180511] Tidal estimation in the Atlantic and Indian Oceans, 3

deg x 3 deg solution p 30 N87-21534 INASA-TM-878121 Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during p 31 N87-21980

An evaluation of the polar ice prediction system [AD-A178522] p 41 N87-23014

### TMOSPHERIC ATTENUATION

Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence on microwave communications planning and rain-rate data p 46 A87-36933 acquisition

A two-look technique for studying atmospheric effects in optical scanner data for the ocean p 26 A87-39178 High resolution sea surface temperature field derived p 33 N87-24731

### ATMOSPHERIC BOUNDARY LAYER

Observations of intermittent cumulus convection in the p 20 A87-32976 boundary layer

Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298

Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431 Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean

p 21 A87-33432 Optical properties of the marine atmospheric boundary p 28 A87-42638 layer - Aerosol profiles

### ATMOSPHERIC CHEMISTRY

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation --- Global Tropospheric Experiment/Chemical Instrumentation Test p 45 A87-33426 Evaluation OH measurement near the intertropical convergence

zone in the Pacific p 21 A87-33430 Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean

p 21 A87-33432

Carbon monoxide measurements over the eastern Pacific during GTE/CITE 1 --- Chemical Instrumentation Test and Evaluation p 21 A87-33435

#### ATMOSPHERIC CIRCULATION

Trace gas exchanges and transports over the p 12 A87-32196 Amazonian rain forest Impact of satellite-based data on FGGE general p 44 A87-32985 circulation statistics

The observational objectives and the implementation p 49 N87-21474 of the Global Weather Experiment

#### ATMOSPHERIC COMPOSITION

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation --- Global Tropospheric ion Test and p 45 A87-33426 Experiment/Chemical Instrumentation Evaluation Atmospheric environment monitoring system based on an earth-to-satellite Hadamard transform laser long-path absorption spectrometer - A proposal

p 45 A87-35502 The possibility of using satellite measurements of

methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125

### ATMOSPHERIC CORRECTION

The AVHRR/HIRS operational method for satellite based sea surface temperature determination

[NOAA-TR-NESDIS-28] p 31 N87-22388 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of

IDE87-0060591 p 41 N87-24011

High resolution sea surface temperature field derived p 33 N87-24731

#### ATMOSPHERIC EFFECTS

Correction for atmospheric and topographic effects on p 37 A87-32489 the Landsat MSS data Simulations of the GOES visible sensor to changing p 47 A87-40756 surface and atmospheric conditions Photographic quality of color IR aerial photos as a function of atmospheric parameters p 42 N87-24799

#### ATMOSPHERIC HEAT BUDGET

Convective heating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982

#### ATMOSPHERIC MODELS

The impact of initial conditions and SST Anomalies on extended range predictions for the El Nino period --- sea p 32 N87-23046 surface temperature (SST) Modelling of atmospheric effects on the angular

distribution of a backscattering peak [DE87-006060] p 41 N87-24014 Ocean wind and wave model comparisons with GEOSAT

(GEOdesy SATellite) satellite data p 33 N87-24061 IAD-A1783021

### ATMOSPHERIC MOISTURE

Balloon-borne infrared multichannel radiometer for remote sensing of high resolution low-level water vapor p 43 A87-32477 fields The 1982-1983 El Nino Atlas: Nimbus-7 microwave

radiometer data

[NASA-CR-180914] p 31 N87-22386

### ATMOSPHERIC OPTICS

Photographic quality of color IR aerial photos as a function of atmospheric parameters p 42 N87-24799

ATMOSPHERIC PHYSICS Atmospheric remote sensing in arctic regions

#### IAD-A1795501 p 50 N87-23012

ATMOSPHERIC SCATTERING Inversion of canopy reflectance models for estimation

of vegetation parameters [NASA-CR-181059] p 12 N87-24737

### ATMOSPHERIC SOUNDING

Carbon monoxide measurements over the eastern Pacific during GTE/CITE 1 --- Chemical Instrumentation Test and Evaluation p 21 A87-33435

Atmospheric environment monitoring system based on an earth-to-satellite Hadamard transform laser long-path absorption spectrometer - A proposal

p 45 A87-35502

Atmospheric remote sensing in arctic regions IAD-A1795501 p 50 N87-23012

### ATMOSPHERIC TEMPERATURE

Observations of intermittent cumulus convection in the boundary layer p 20 A87-32976

### ATTENUATION COEFFICIENTS

The relationship between phytoplankton concentration and light attenuation in ocean waters p 29 A87-42642

### ATTITUDE (INCLINATION)

The effects of camera position and attitude data in aer triangulation, a simulation study p 52 N87-24750 AUSTRALIA

Habitat mapping by Landsat for aerial census of kangaroos p 2 A87-32094

Australian utilization and research into remote sensing p 20 A87-32490

BIOSPHERE

Applied remote sensing --- Book

**BLACK AND WHITE PHOTOGRAPHY** 

Active and passive remote sensing of ice

A comparison of optical bar, high-altitude, and black-and-white photography in land classification

Radar scene generation for tactical decision aids

BISTATIC REFLECTIVITY

BORN APPROXIMATION

[NASA-CR-180234]

AD-A179461

p 45 A87-33122

p 32 N87-24009

p 4 A87-35122

p 40 N87-20449

AUTOMATION	BOUNDARY VALUE PROBLEMS	Interring spectral reflectances of plant elements by
Problems in the automation of map-compilation	Introduction of initial centers for the algorithm of	simple inversion of bidirectional reflectance
processes on the basis of remote-sensing data	clustering around mobile centers in multispectral image	measurements p.7 A87-37281
p 38 A87-35925	classification p 37 A87-35313	Airborne remote sensing of forest biomes
AVIONICS	The impact of initial conditions and SST Anomalies on	p.9 A87-40301
The integration of spectral and spatial analysis for land	extended range predictions for the El Nino period ··· sea	Error analysis of leaf area estimates made from
use classification	surface temperature (SST) p 32 N87-23046	allometric regression models
[AD-A178703] p 14 N87-23015	BRIGHTNESS	[NASA-TM-89220] p 11 N87-24010
AXES OF ROTATION	Relation between precipitation and brightness of earth	New dimension analyses with error analysis for quaking
Polar motion-induced gravity p 15 A87-36176	surface in the NOAA/GVIP data p.3 A87-32498	aspen and black spruce
<b></b>	BRIGHTNESS DISTRIBUTION	[NASA-TM-89219] p 11 N87-24735
_	Phase portraits of vegetation development trajectories	Inversion of canopy reflectance models for estimation
8	in a multidimensional spectral attribute space	of vegetation parameters
	p 10 A87-41771	[NASA-CR-181059] p ½ N87-24737
BACKSCATTERING	BRIGHTNESS TEMPERATURE	CARBON DIOXIDE
The relation of millimeter-wavelength backscatter to	Quantifying spatial and temporal variabilities of	A review of national and international activities on
surface snow properties p 34 A87-35518	microwave brightness temperature over the U.S. Southern Great Plains p.5 A87-35309	modeling the effects of increased CO2 concentrations on
Radiometric correction of SAR images - A new correction	Great Flains p. 3 Nov. 33303	the simulation of regional crop production. A report on
algorithm p 40 A87-39184	•	linkage between climate and crop models
Two-color short-pulse laser altimeter measurements of	C	(DE87-005994) p 10 N87-22336
ocean surface backscatter p 27 A87-39462		The impact of climate change from increased
Radar scene generation for tactical decision aids	CADASTRAL MAPPING	atmospheric carbon dioxiue on American agriculture
[NASA-CR-180234] p 40 N87-20449	The VICOM system for digital image processing at the	[DOE/NBB-0077] p.11 N87-23032
NASA/MSFC large stretch press study	Institute of Cartography of Technical University, Hanover	CARBON MONOXIDE
[NASA-CR-180376] p 41 N87-20554	(West Germany) p 16 N87-22290	Carbon monoxide measurements over the eastern
Modelling of atmospheric effects on the angular	CALIBRATING	Pacific during GTE/CITE 1 Chemical Instrumentation
distribution of a backscattering peak	Deriving surface albedo measurements from narrow	Test and Evaluation p 21 A87-33435
[DE87-006060] p 41 N87-24014	band satellite data p 13 A87-39182	CELESTIAL GEODESY
BALLOON SOUNDING	Impact of radiance variations on satellite sensor calibration p 47 A87-39457	The determination of earth-rotation parameters from
Exploration of geomagnetic field anomaly with balloon	Thoughts on a standard algorithm for camera	satellite laser ranging p 15 A87-34186
for geophysical research p 17 A87-32478	calibration p 51 N87-24743	GINFEST - Geodetic intercomparison network for
BALLOON-BORNE INSTRUMENTS	Applied formulae for calibration of aerial	evaluating space techniques p 15 A87-36164
Balloon-borne infrared multichannel radiometer for	photogrammetric cameras p 51 N87-24744	Creation of a global geodetic network using Mark III
remote sensing of high resolution low-level water vapor	Geometrical system calibration, especially for metric	VLBI p 15 A87-36166
fields p 43 A87-32477	aerial cameras p 51 N87-24745	GPS-based geodesy in California. Mexico and the Caribbean p 16 A87-41380
BAND RATIOING	Radiometric calibration of the Shuttle Imaging Radar	CHANGE DETECTION
The regression intersection method of adjusting image	(SIR-C) system p 53 N87-24756	Landcover change in Hiroshima during 1979/1984
data for band ratioing p 45 A87-35306	Proposed changes to the Canadian camera calibration	detected by Landsat MSS and TM data
A software defoliant for geological analysis of band	report p 53 N87-24757	p 12 A87 32494
ratios p 18 A87-39193	The role of government specifications in aerial photography p 57 N87-24780	CHARGE COUPLED DEVICES
BANDWIDTH	photography p 57 N87-24780  Determination of spectral reflectance of crops during	Aerial triangulation of CCD line-scanner images
Data Compression System for video images p 46 A87-37421	growth from calibrated multispectral small format aerial	p 54 N87-24769
BARLEY	photography p 12 N87-24801	Modern CCD sensors and their applications in Earth
Influence of different nitrogen and irrigation treatments	Image quality problems in practical aerial photography	observation and planetary missions p 55 N87-24813 CHLOROPHYLLS
on the spectral reflectance of barley p 2 A87-32090	p 43 N87-24814	A two-look technique for studying atmospheric effects
BAROCLINIC INSTABILITY	CALIFORNIA	in optical scanner data for the ocean p 26 A87-39178
Feedback between ice flow, barotropic flow, and	Radar as a complement to topographic maps for	The relationship between phytoplankton concentration
baroclinic flow in the presence of bottom topography	delineating marine terraces	and light attenuation in ocean waters p 29 A87-42642
p 27 A87-40289	[PB87-154597] p 41 N87-24013	Remote sensing of chlorophyll concentrations in the
BAROTROPIC FLOW	CAMERAS	northern Gulf of Mexico p 29 A87-42643
Feedback between ice flow, barotropic flow, and	Thoughts on a standard algorithm for camera	A model for the use of satellite remote sensing for the
baroclinic flow in the presence of bottom topography	calibration p 51 N87-24743	measurement of primary production in the ocean
p 27 A87-40289	Applied formulae for calibration of aerial	p 29 A87-42644
BATHYMETERS	photogrammetric cameras p 51 N87-24744	Sunlight induced 685 nm fluorescence imagery
Potential of laser remote sensing of oil below water	Geometrical system calibration, especially for metric	p 30 A87-42646
surface	aerial cameras p 51 N87-24745	CHRONOLOGY
[FOA-C-30435-3.1] p 30 N87-20659	The use of camera orientation data in photogrammetry:	LANDSAT-based lineament analysis, East Texas Basin,
BAYES THEOREM	A review p 52 N87-24749	and structural history of the Sabine Uplift area, East Texas
Landsat as an aid in evaluating the adequacy of a grain	The effects of camera position and attitude data in aerial	and North Louisiana
silo network p 7 A87-37282	triangulation, a simulation study p 52 N87-24750	[PB87-176327] p 19 N87-24043
BAYS (TOPOGRAPHIC FEATURES)	Proposed changes to the Canadian camera calibration	CHUKCHI SEA
Aircraft radiopositioning for airborne photography during	report p 53 N87-2475/	Statistical description of the summertime ice edge in the Chukchi Sea, task 2
hydrographic coastal surveys p 23 A87-36945	Wild Aviophot (TM) RC20 aerial camera system. The	[DE87-001056] p 31 N87-22387
BIOMASS	other approach to image motion compensation in aerial	CITIES
Forest biomass, canopy structure, and species	photography p 54 N87-24782	Polarization, land use type and intraurban location as
composition relationships with multipolarization L-band	CANADA	variables in SAR mapping accuracy p 12 A87-32953
synthetic aperture radar data p 4 A87-35121	On the relative accuracy of satellite and raingage rainfall	Comparison of Landsat MSS and TM data for urban
Error analysis of leaf area estimates made from	measurements over middle latitudes during daylight	land-use classification p 13 A87-35523
allometric regression models	hours p 34 A87-33295	Testing the consistency for mapping urban vegetation
[NASA-TM-89220] p 11 N87-24010	CANADIAN SHIELD	with high-altitude aenal photographs and Landsat MSS
New dimension analyses with error analysis for quaking	Shuttle Imaging Radar (SIR-B) investigations of the	data p 13 A87-37277
aspen and black spruce	Canadian shield - Initial Report p 17 A87-31410	An assessment of Landsat MSS and TM data for urban
[NASA-TM-89219] p 11 N87-24735	Spatial characterization of acid rain stress in Canadian	and near-urban land-cover digital classification
Inversion of canopy reflectance models for estimation	Shield lakes	p 13 A87-37280
of vegetation parameters [NASA-CR-181059] p 12 N87-24737	[NASA-CR-180983] p 36 N87-24031	Urban land use separability as a function of radar polarization p 14 A87-39188
BIOPHYSICS	Spatial characterization of acid rain stress in Canadian	Towards an automatic identification of urban textures
Canopy reflectance, photosynthesis, and transpiration.	Shield lakes	p 14 N87-24747
II - The role of biophysics in the linearity of their	[NASA-CR-180982] p 36 N87-24032	CLASSIFICATIONS
interdependence p 6 A87-37278	CANOPIES (VEGETATION)	Landsat classification of Argentina summer crops

Estimation of canopy parameters of row planted

p 2 A87-32093

p 6 A87-37278

p 6 A87-37279

vegetation canopies using reflectance data for only four

Forest biomass, canopy structure, and species composition relationships with multipolarization L-band synthetic aperture radar data p 4 A87-35121

Canopy reflectance, photosynthesis, and transpiration.

Computation of diffuse sky irradiance from

multidirectional radiance measurements

II - The role of biophysics in the linearity of their

interdependence

p 12 N87-24737 and international activities on creased CO2 concentrations on ai crop production. A report on and crop models p 10 N87-22336 nate change from increased ue on American agriculture p 11 N87-23032 easurements over the eastern 1 --- Chemical Instrumentation p 21 A87-33435 earth-rotation parameters from n 15 A87-34186 intercomparison network for p 15 A87-36164 geodetic network using Mark III p 15 A87-36166 in California, Mexico and the p 16 A87-41380 n Hiroshima during 1979/1984 S and TM data p 12 A87-32494 CES CCD line-scanner images p 54 N87-24769 and their applications in Earth v missions p 55 N87-24813 for studying atmospheric effects or the ocean p 26 A87-39178 en phytoplankton concentration cean waters p 29 A87-42642 alorophyll concentrations in the p 29 A87-42643 satellite remote sensing for the production in the ocean p 29 A87-42644 im fluorescence imagery p 30 A87-42646 ment analysis. Fast Texas Basin he Sabine Uplift area, East Texas p 19 N87-24043 of the summertime ice edge in p 31 N87-22387 type and intraurban location as p 12 A87-32953 accuracy at MSS and TM data for urban p 13 A87-35523 y for mapping urban vegetation photographs and Landsat MSS p 13 A87-37277 dsat MSS and TM data for urban er digital classification p 13 A87-37280 arability as a function of radar p 14 A87-39188 identification of urban textures p 14 N87-24747 Landsat classification of Argentina summer crops p 3 A87-32098 Comparison of Landsat MSS and TM data for urban and-use classification p 13 A87-35523
An assessment of Landsat MSS and TM data for urban land-use classification and near-urban land-cover digital classification p 13 A87-37280 CLIMATE The impact of climate change from increased atmospheric carbon dioxide on American agriculture p 11 N87-23032 IDOE/NBB-00771 CLIMATOLOGY World-wide weather --- Book p 56 A87-33125 **A-3** 

CLOUD COVER SUBJECT INDEX

A crop condition and crop yield estimation method based The impact of climate change from increased Reports on cartography and geodesy, series 1, number on NOAA/AVHRR satellite data p 10 N87-22280 atmospheric carbon dioxide on American agriculture |DOE/NBB-0077| p 11 N87-23032 p 16 N87-22286 HSSN-0469-42361 A review of national and international activities on modeling the effects of increased CO2 concentrations on CLOUD COVER The VICOM system for digital image processing at the the simulation of regional crop production. A report on Remote-sensing method for determining monthly Institute of Cartography of Technical University, Hanover precipitation sums using Meteor-satellite data on the p 16 N87-22290 linkage between climate and crop models DE87-0059941 p 10 N87-22336 Atlantic Ocean p 21 A87-34447 COMPUTER GRAPHICS The impact of climate change from increased Cloud-cover and precipitation patterns over the Republic Reports on cartography and geodesy, series 1, number of Guinea according to ground-based and satellite atmospheric carbon dioxide on American agriculture p 11 N87-23032 DOE/NBB-0077 p 35 A87-36102 observations HSSN-0469-42361 p 16 N87-22286 Reflectivity of earth's surface and clouds in ultraviolet Determination of spectral reflectance of crops during The VICOM system for digital image processing at the p 47 A87-40768 from satellite observations growth from calibrated multispectral small format aerial Institute of Cartography of Technical University, Hanover CLOUD PHYSICS (West Germany) photography p 12 N87-24801 o 16 N87-22290 Atmospheric remote sensing in arctic regions CROP IDENTIFICATION CHART A computer plotting package for the display p 50 N87-23012 IAD-A1795501 of position-dependent marine data Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 COAL IPR87-1486071 o 31 N87-22297 Workshop on Space Remote Sensing for Agricultural High resolution remote sensing of spatially and spectrally COMPUTER PROGRAMS complex coal surface mines of central Pennsylvania - A CHART A computer plotting package for the display and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986. comparison between simulated SPOT MSS and Landsat-5 Proceedings A87-32007 рΙ of position-dependent marine data Identifying vegetable crops with Landsat Thematic p 18 A87-39468 IPB87-1486071 p 31 N87-22297 COASTAL CURRENTS p.4 A87-35120 COMPUTER VISION Mapper data DUCK '85 nearshore waves and currents experiment Some observations on crop profile modelling The integration of spectral and spatial analysis for land p 5 A87-35310 data summary report use classification A comparison of supervised maximum likelihood and IAD A1774191 p 14 N87-23015 p 31 N87-22382 [AD-A178703] decision tree classification for crop cover estimation from COASTAL WATER Smart sensors. An overview and selected examples p 5 .487-35312 Remotel -sensed tracers for hydrodynamic surface flow multitemporal Landsat MSS data p 51 N87-24740 Landsat as an aid in evaluating the adequacy of a grain flo network p.7 A87-37282 estimation p 26 A87-39176 COMPUTERIZED SIMULATION A two-look technique for studying atmospheric effects Simulation software of synthetic aperture radai in optical scanner data for the ocean p 26 A87-39178 p 37 A87-32506 Rice crop identification and area estimation using Continental shelf processes affecting the oceanography CONFERENCES remotely-sensed data from Indian cropping patterns p 9 A87-41434 of the South Atlantic Bight Workshop on Space Remote Sensing for Agricultural p 30 N87-20716 Real-time crop assessment using color theory and atellite data p 10 N87-20619 (DE87-0053031 and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986. COASTAL ZONE COLOR SCANNER satellite data p 1 A87-32007 Proceedings Foundations and applications of multispectral scanning The interaction of light with phytoplankton in the marine International Conference on Earth Rotation and the environment p 29 A87-42640 Terrestrial Reference Frame, Columbus, OH, July 31-Aug in agriculture [NLR-MP-85015-U] Remote sensing of chlorophyll concentrations in the p 10 N87-21408 2, 1985, Proceedings. Volumes 1 & 2 northern Gulf of Mexico p 29 A87-42643 p 15 A87-36126 **CROP INVENTORIES** A model for the use of satellite remote sensing for the Measuring ocean waves from space; Proceedings of the Landsat classification of Argentina summer crops p 3 A87-32098 measurement of primary production in the ocean Symposium, Johns Hopkins University, Laurel, MD, Apr A87-42644 **CROP VIGOR** p 29 15-17, 1986 p 24 A87-38826 Coastal zone color scanner imagery of phytoplankton Ocean optics VIII, Proceedings of the Meeting, Orlando, Real-time crop assessment using color theory and pigment distribution in Icelandic waters satellite data p 10 N87-20619 FL, Mar 31-Apr 2, 1986 [SPIE-637] A crop condition and crop yield estimation method based p 29 A87-42645 p 28 A87-42637 on NOAA/AVHRR satellite data COASTS Proceedings of the European Symposium on Polar p 10 N87-22280 CRUSTAL FRACTURES Geochronological studies of strandlines of Saurashtra. platform Opportunities and Instrumentation Remote-Sensing (ESPOIR) India, detected by remote sensing techniques Quick-look guide to the crustal dynamics project's data p 15 A87-35308 [ESA-SP-266] p 48 N87-20621 information system [NASA-TM 87818] Remote sensing of coastal wetlands Proceedings of the International Symposi m on Progress p 16 N87-23018 p 9 A87-40944 CUMULU. LLOUDS a Imaging Sensors DUCK '85 nearshore waves and currents experiment p 50 N87-24738 [ESA-SP-252] Observations of intermittent cumulus convection in the boundary layer p 20 A87-32976 data summary recort CONIFERS IAD-A1774191 p 31 N87-22382 New dimension analyses with error analysis for quaking Optical properties of the marine atmospheric boundary Studies of the east Australian current off northern New aspen and black spruce layer - Aerosol profiles p 28 A87-42638 South Wales INASA-TM-892191 p 11 N87-24735 p 32 N87-23103 IAD-A1784611 CONTINENTAL SHELVES Utilizing remote sensing of thematic mapper data to Continental shelf processes affecting the oceanography improve our understanding of estuarine processes and of the South Atlantic Bight DAMAGE ASSESSMENT their influence on the productivity of estuarine-dependent IDE87-0053031 p 30 N87-20716 Monsoon flood boundary delineation and damage fisheries CONVECTION CLOUDS assessment using space borne imaging radar and Landsat [NASA-CR-180984] p 33 N87-24012 Observations of intermittent cumulus convection in the p 35 A87-39467 p 20 A87-32976 Radar as a complement to lopographic maps for boundary layer Spatial characterization of acid rain stress in Canadian delineating marine terraces The area-time-integral technique to estimate convective Shield lakes PB87-154597 p 41 N87-24013 rain volumes over areas applied to satellite data - A p 36 N87-24032 NASA-CR-180982 COLLOCATION. preliminary investigation p 35 A87-40249 DATA ACQUISITION Reports on cartography and geodesy, series 1, number CONVECTIVE HEAT TRANSFER Analysis of moderate and intense rainfall rates Convective heating and precipitation estimates for the continuously recorded over half a century and influence USSN-0469-42361 p 16 N87-22282 tropical South Pacific during FGGE, 10-18 January 1979 on microwave communications planning and rain-rate data **COLOR INFRARED PHOTOGRAPHY** p 21 A87-32982 p 46 A87-36933 acquisition comparison of optical bar. high-altitude, and CONVERGENCE Report of the workshop on Assimilation of Satellite Wind black-and-white photography in land classification Physical principles of image convergence in remote p 4 A87-35122 and Wave Data in Numerical Weather and Wave Prediction p 40 A87-41925 Models Comparison between digital and manual interpretation COOLING | WCP-1221 p 49 N87-21521 of high altitude aerial photographs p 48 A87-42257 Satellite measurements of sea surface cooling during Real-time crop assessment using color theory and hurricane Gloria A modular and versatile acquisition, recording and p 24 A87-37886 preprocessing system for airborne remote sensing atellite data p 10 N87-20619 CORAL REEFS p 52 N87-24751 Photographic quality of color IR aenal photos as a Coral reef remote sensing applications Digital data acquisition for close-range function of atmospheric parameters p 42 N87 24799 p 20 A87-32951 p 54 N87-24785 photogrammetry **COLOR PHOTOGRAPHY** COVARIANCE Remote Sensing Information Sciences Research Group Spectrophotometric measurements on color aerial A new covariance model for inertial gravimetry and cradiometry Santa Barbara Information Sciences Research Group, year p 55 N87-24798 photographs p 14 A87-31591 COMMERCE INASA-CR-1810731 ρ 43 N87-24817 Remote sensing applications. Commercial issues and Optical Transfer Function (OTF)-based quality criteria DATA BASE MANAGEMENT SYSTEMS opportunities for space station - SPOT for aerial cameras and imaging systems The Geomulti database management system p 57 N87-20626 p 39 A87-37802 COMMUNICATION SATELLITES **CROP GROWTH** Reports on cartography and geodesy, series 1, number Arianespace top performance benefits ESA Remote sensing methods of yield forecasting p 57 N87-24493 HSSN-0469-42361 p 16 N87-22286 COMPUTATIONAL GRIDS Procedures for the description of agricultural crops and Tidal estimation in the Atlantic and Indian Oceans, 3 The VICOM system for digital image processing at the soils in optical and microwave remote sensing studies deg x 3 deg solution (NASA-TM-87812) Institute of Cartography of Technical University, Hanover р8 p 16 N87-22290 (West Germany) p 30 N87-21534 Phase portraits of vegetation development trajectories COMPUTER AIDED MAPPING Problems in merging Earth sensing satellite data sets in a multidimensional spectral attribute space NASA-TM-878201 p 50 N87-22457 p 10 A87-41771 Problems in the automation of map-compilation processes on the basis of remote-sensing data Foundations and applications of multispectral scanning Quick-look guide to the crustal dynamics project's data p 38 A87-35925 in agriculture information system [NLR-MP-85015-U] [NASA-TM-87818] Mapping from space p 38 A87-36361 p 10 N87-21408 p 16 N87-23018

DATA COMPRESSION	The microwave measurement of ocean-wave directional	The production of photographs of the Earth's surface
Data Compression System for video images	spectra p 24 A87-38836	taken from satellites and their application in map production
p 46 A87-37421	Surface bicirectional reflectance properties of two	and map revision p 55 N87-24788
DATA PROCESSING	southwestern Arizona deserts for wavelengths between	Earth Resources Satellite (ERS-1) project in Japan
Remote sensing - Handling the data	0.4 and 2.2 micrometers	p 57 N87-24797
p 38 A87-36359	NASA-TP-2643  p 49 N87-22281	Earth observation experiments on the German Spacelab
What, where, when, why? Extracting information from	DISTANCE MEASURING EQUIPMENT	mission D2 p 55 N87-24811
remote sensing data p 46 A87-37055	Reports on cartography and geodesy, series 1, number	The Monocular Electro-Optical Stereo Scanner
Montane vegetation stratification through digital	96	(MEOSS) satellite experiment p 55 N87-24812
processing of Landsat MSS data p 9 A87-40302	[ISSN-0469-4236] p 16 N87-22282	Modern CCD sensors and their applications in Earth
Report of the workshop on Assimilation of Satellite Wind	DIURNAL VARIATIONS	observation and planetary missions p 55 N87-24813
and Wave Data in Numerical Weather and Wave Prediction	An evaluation of satellite-based insolation estimates for	
Models	Ohio p 34 A87-33297	The Modular Optoelectronic Multispectral Scanner
[WCP-122] p 49 N87-21521	DMSP SATELLITES	(MOMS) program of the Bundesministerium fuer Forschung und Technologie (BMFT) Milestones in the
DATA RETRIEVAL	United States remote sensing satellites (RSSs) past.	
	present, and future p 56 A87-32502	development of an operational Earth Observation system p.55 N87-24815
Applications of satellite microwave radiometry in	DOPPLER RADAR	• • • • • • • • • • • • • • • • • • • •
Finland p 44 A87-32952	Airborne microwave Doppler measurements of ocean	EARTH OBSERVING SYSTEM (EOS)
DATA SIMULATION	wave directional spectra p 26 A87-39180	Problems in merging Earth sensing satellite data sets
High resolution remote sensing of spatially and spectrally	DUNES	[NASA-TM-87820] p 50 N87-22457
complex coal surface mines of central Pennsylvania - A	Landsat image enhancement study of possible	Remote Sensing Information Sciences Research Group
comparison between simulated SPOT MSS and Landsat-5	submerged sand-dunes in the Arabian Gulf	Santa Barbara Information Sciences Research Group, year
thematic mapper p 18 A87-39468	p 22 A87-35315	4
Simulations of the GOES visible sensor to changing	DYNAMIC CHARACTERISTICS	NASA-CR-181073  p 43 N87-24817
surface and atmospheric conditions p 47 A87-40756	Optical dynamics experiment (ODEX) data report R/V	EARTH PLANETARY STRUCTURE
DATA SMOOTHING	acania expedition 10 October-17 November 1982. Volume	Exploration of geomagnetic field anomaly with balloon
Biharmonic spline interpolition of GEOS-3 and Seasat	2: Particle size distributions. Volume 6 Scalar	for geophysical research p 17 A87-32478
altimeter data p 20 A87-32770	spectral-radiometer data	EARTH RESOURCES
DECIDUOUS TREES	[AD-A178535] p 32 N87-23104	The Netherlands-Indonesian remote-sensing saterlite
Error analysis of leaf area estimates made from	DYNAMIC MODELS	TERS p 43 A87-32210
allometric regression models	Use of satellite altimetry for ocean monitoring	Indian remote sensing programme p 56 A87-32955
[NASA-TM-89220] p 11 N87-24010	p 23 A87-36101	Statistical evaluation of forest characteristics from aerial
New dimension analyses with error analysis for quaking	DYNAMICAL SYSTEMS  Ough look guide to the crustal dynamics project's data	and space photographs p 5 A87-36109
aspen and black spruce	Quick-look guide to the crustal dynamics project's data	Aerial and space investigations of soils and vegetation
[NASA-TM-89219] p 11 N87-24735	information system [NASA-TM-87818] p 16 N87-23018	Russian book p 6 A87-36579
DECISION THEORY	[NASA-TM-87818] p 16 N87-23018	The Geomulti database management system
A comparison of supervised maximum likelihood and	_	p 39 A87-37802
decision tree classification for crop cover estimation from	E	The application of remote sensing techniques in China
multitemporal Landsat MSS data p 5 A87-35312		p 57 A87-41435
DEFORESTATION	EARTH ALBEDO	Land panel report International Space Station
Relation between precipitation and brightness of earth	Deriving surface albedo measurements from narrow	p 49 N87-20634
surface in the NOAA/GVIP data p 3 A87-32498	band satellite data p 13 A87-39182	Earth Resources Satellite (ERS-1) project in Japan
Deforestation in the tropics - New measurements in the	Satellite estimation of a solar irradiance at the surface	p 57 N87-24797 EARTH ROTATION
Amazon Basin using Landsat and NOAA advanced very	of the earth and of surface albedo using a physical model	
high resolution radiometer imagery p 4 A87-33441  DESERTIFICATION	applied to Meteosat data p 47 A87-40246	Earth rotation, station coordinates and orbit determination from satellite laser ranging
	EARTH ATMOSPHERE	p 43 A87-32349
Relation between precipitation and brightness of earth surface in the NOAA/GVIP data p. 3 A87-32498	Applied remote sensing Book p 45 A87-33122	The determination of earth-rotation parameters from
	Modelling of atmospheric effects on the angular	satellite laser ranging p 15 A87-34186
Reconnaissance of vegetal formations in a Guinean	distribution of a backscattering peak	
tarant annias bu manan at Landant annan	distribution of a packscattering peak	
forest sector by means of Landsat images	[DE87-006060] p 41 N87-24014	International Conference on Earth Rotation and the
p 6 A87-36946		Terrestrial Reference Frame, Columbus, OH, July 31-Aug.
p 6 A87-36946 DESERTS	[DE87-096060] p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH, July 31-Aug. 2, 1985, Proceedings, Volumes 1 & 2
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two	[DE87-096060] p 41 N87-24014 EARTH CORE	Terrestrial Reference Frame, Columbus, OH, Juli, 31-Aug. 2, 1985, Proceedings, Volumes 1 & 2 p 15 A87-36126
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between	[DE87-096060] p 41 N87-24014  EARTH CORE  Global images of the earth's interior	Terrestrial Reference Frame, Columbus, OH, July 31-Aug 2, 1985, Proceedings Volumes 1 & 2 p 15 A87-36126 Polar motion-induced gravity p 15 A87-36176
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers	[DE87-006060] p 41 N87-24014  EARTH CORE Global images of the earth's interior p 15 A87-37918  EARTH CRUST Global images of the earth's interior	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug 2, 1985, Proceedings Volumes 1 & 2 p 15 A87-36126 Polar motion-induced gravity p 15 A87-36176 EARTH SURFACE
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers  [NASA-TP-2643]  p 49 N87-22281	DE87-096060   p 41 N87-24014   EARTH CORE Global images of the earth's interior	Terrestrial Reference Frame, Columbus, OH. July. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2 p. 15 A87-36126  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using
DESERTS Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281 DEVELOPING NATIONS	[DE87-096060] p 41 N87-24014  EARTH CORE Global images of the earth's interior p 15 A87-37918  EARTH CRUST Global images of the earth's interior p 15 A87-37918  EARTH OBSERVATIONS (FROM SPACE)	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  p. 15 A87-36126  Polar motion-induced gravity. p. 15 A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers [NASA-TP-2643]  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2 p. 15. A87-36126  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers [NASA-TP-2643]  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world  p 56 A87-34799	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug 2, 1985, Proceedings Volumes 1 & 2 p 15 A87-36126  Polar motion-induced gravity p 15 A87-36176  EARTH SURFACE Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493  Polar motion-induced gravity p 15 A87-36176
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p.49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p.56 A87-34799  DIFFUSE RADIATION	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15 A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12 A87-32493  Polar motion-induced gravity. p. 15 A87-36176  Mapping from space. p. 38 A87-36361
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers [NASA-TP-2643]  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world  p 56 A87-34799	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug 2, 1985, Proceedings Volumes 1 & 2 p 15 A87-36126  Polar motion-induced gravity p 15 A87-36176  EARTH SURFACE Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493  Polar motion-induced gravity p 15 A87-36176
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizonal deserts for wavelengths between 0.4 and 2.2 micrometers   p.49   N87-22281    DEVELOPING NATIONS   Intelsat's small earth stations - Impact on the developing world   p.56   A87-34799    DIFFUSE RADIATION   Computation   of diffuse   sky   irradiance   from	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15 A87-36126  Polar motion-induced gravity. p. 15 A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsal MSS data on the assumption of reciprocity on light scattering. p. 12 A87-32493  Polar motion-induced gravity. p. 15 A87-36176  Mapping from space. p. 38 A87-36361  Computation of diffuse. sky. irradiance from
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers [NASA-TP-2643]  DEVELOPING NATIONS Intelisat's small earth stations - Impact on the developing world  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p 15 A87-36126  Polar motion-induced gravity p 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493  Polar motion-induced gravity p 15 A87-36176  Mapping from space p 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements
p 6 A87-36946  DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p 6 A87-37279	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15 A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12 A87-32493  Polar motion-induced gravity. p. 15 A87-36176  Mapping from space. p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6 A87-37279
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers [NASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p 15 A87-36176  EARTH SURFACE Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493  Polar motion-induced gravity p 15 A87-36176  Mapping from space p 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements  p 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Comparison of HCMM and GOES satellite temperatures
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA.TP.2643  p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p.56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p.6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p.38 A87-37276  Measurements on digitized hardcopy images	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38098
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images  p. 39 A87-37290	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36126  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38098  Surface models including direct cross-radiation. A
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers  [NASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelisat's small earth stations - Impact on the developing world  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-34799  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images  p. 39 A87-37290  Montane vegetation stratification through digital	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p 15 A87-36126  Polar motion-induced gravity p 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493  Polar motion-induced gravity p 15 A87-36176  Mapping from space p 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements  p 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281   DEVELOPING NATIONS	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p. 12 A87-32493  Polar motion-induced gravity p. 15 A87-36176  Mapping from space p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281  DEVELOPING NATIONS   Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images  Montane vegetation stratification through digital processing of Landsat MSS data p.9 A87-40302  DIGITAL RADAR SYSTEMS	DE87-096060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36126  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36176  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38098  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38098  Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers    NASA-TP-2643   p.49 N87-22281	DE87-096060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p. 15 A87-36126  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p. 12 A87-32493  Polar motion-induced gravity p. 15 A87-36176  Mapping from space p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances  Satellite estimation of a solar irradiance at the surface
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers     NASA-TP-2643   p.49   N87-22281     DEVELOPING NATIONS     p.56   A87-34799     DIFFUSE RADIATION   Computation of diffuse sky irradiance from multidirectional radiance measurements	DE87-096060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul., 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198  Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37299  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37299  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 8 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images  p. 39 A87-37290  Montane vegetation stratification through digital processing of Landsat MSS data p. 9 A87-40302  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506	DE87-096060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances. Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers    NASA-TP-2643   p. 49 N87-22281	DE87-0/66060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985. Proceedings: Volumes 1 & 2  Polar motion-induced gravity: p. 15 A87-36126  Polar motion-induced gravity: p. 15 A87-36176  EARTH SURFACE: Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering: p. 12 A87-32493  Polar motion-induced gravity: p. 15 A87-36176  Mapping from space: p. 18 A87-36361  Computation: of diffuse sky irradiance from multidirectional radiance measurements: p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor: p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics: p. 39 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics: p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces: p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances: p. 40 A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47 A87-40246  Simulations of the GOES visible sensor to changing
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281	DE87-006060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38098  Surface models including direct cross-radiation - A. simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA.TP.2643  p. 49 N87-22281  DEVELOPING NATIONS   Intelsat's small earth stations - Impact on the developing world p.56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-32281  DEVELOPING NATIONS  Intelsat's small earth stations - Impact on the developing world p.56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 9.38 A87-37276  Measurements on digitized hardcopy images  p. 39 A87-37290  Montane vegetation stratification through digital processing of Landsat MSS data p. 9 A87-40302  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar  p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286	DE87-096060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p. 12 A87-32493  Polar motion-induced gravity p. 15 A87-36176  Mapping from space p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p. 7 A87-38098  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances p. 40 A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions p. 47 A87-40756  Reflectivity of earth's surface and clouds in ultraviolet
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281   DEVELOPING NATIONS   Intelisat's small earth stations - Impact on the developing world p. 56 A87-34799   DIFFUSE RADIATION   Computation of diffuse sky irradiance from multidirectional radiance measurements   p. 6 A87-37279   p. 6 A87-37279   p. 6 A87-37279	DE87-006060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985. Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36126  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198  Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations. p. 47. A87-40768
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281	DE87-006060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July, 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p. 12 A87-32493  Polar motion-induced gravity p. 15 A87-36176  Mapping from space p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p. 7 A87-38098  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances p. 40 A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions p. 47 A87-40756  Reflectivity of earth's surface and clouds in ultraviolet
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281  DEVELOPING NATIONS   p. 49 N87-22281  DEVELOPING NATIONS   Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION   p. 6 A87-34799  DIFFUSE RADIATION   Computation of diffuse sky irradiance from multidirectional radiance measurements   p. 6 A87-37279  DIGITAL DATA   p. 6 A87-37279  DIGITAL DATA   Combining panchromatic and multispectral imagery from dual resolution satellite instruments   p. 38 A87-37276  Measurements on digitized hardcopy images   p. 39 A87-37290  Montane vegetation stratification   through digital processing of Landsat MSS data   p. 9 A87-3020  DIGITAL RADAR SYSTEMS   p. 37 A87-32506  DIGITAL SYSTEMS   p. 37 A87-32506  DIGITAL SYSTEMS   Reports on cartography and geodesy, series 1, number 97   (ISSN-0469-4236)   p. 16 N87-22286   The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy   p. 53 N87-24768	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p. 12 A87-32493  Polar motion-induced gravity p. 15 A87-36176  Mapping from space p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances p. 40 A87-39198  Thematic Mapper bandpass solar exoatmospheric of the earth and of surface albedo using a physical model applied to Meteosat data p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions p. 47 A87-40756  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations p. 47 A87-40768  Satellite sensing of aerosol absorption p. 47 A87-40768
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers    NASA-TP-2643  p. 49 N87-22281	IDE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38094  Comparison of HcMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38094  Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39189  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246 Reflectivity of earth's surface and clouds in ultraviolet from satellite observations.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers   NASA-TP-2643  p. 49 N87-22281  DEVELOPING NATIONS   p. 49 N87-22281  DEVELOPING NATIONS   Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION   p. 6 A87-34799  DIFFUSE RADIATION   Computation of diffuse sky irradiance from multidirectional radiance measurements   p. 6 A87-37279  DIGITAL DATA   p. 6 A87-37279  DIGITAL DATA   Combining panchromatic and multispectral imagery from dual resolution satellite instruments   p. 38 A87-37276  Measurements on digitized hardcopy images   p. 39 A87-37290  Montane vegetation stratification   through digital processing of Landsat MSS data   p. 9 A87-3020  DIGITAL RADAR SYSTEMS   p. 37 A87-32506  DIGITAL SYSTEMS   p. 37 A87-32506  DIGITAL SYSTEMS   Reports on cartography and geodesy, series 1, number 97   (ISSN-0469-4236)   p. 16 N87-22286   The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy   p. 53 N87-24768	DE87-006060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36126  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493. Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361. Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279. Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094. Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198. Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39199. Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246. Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40746. Satellite sensing of aerosol absorption. p. 47. A87-40768. Satellite sensing of aerosol absorption.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers.  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements.  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images.  p. 39 A87-37290  Montane vegetation stratification processing of Landsat MSS data p. 9 A87-40302  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy. series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p. 12 A87-32493  Polar motion-induced gravity p. 15 A87-36176  Mapping from space p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38094  Comparison of HcMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances p. 40 A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions p. 47 A87-40246 from satellite observations p. 47 A87-40268  Satellite sensing of aerosol absorption p. 47 A87-40756  Satellite sensing of aerosol absorption p. 47 A87-40770  Physical principles of image convergence in remote sensing p. 40 A87-41925
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers     NASA-TP-2643   p. 49 N87-22281     NASA-TP-2643   p. 49 N87-22281     DEVELOPING NATIONS   Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799     DIFFUSE RADIATION     Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279     DIGITAL DATA   Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276     Measurements on digitized hardcopy images p. 39 A87-37290     Montane vegetation stratification processing of Landsat MSS data p. 9 A87-40302     DIGITAL RADAR SYSTEMS   Simulation software of synthetic aperture radar p. 37 A87-32506     DIGITAL SYSTEMS   P. 16 N87-22286     The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768     DIGITAL TECHNIQUES   DIGITAL TECHNIQUES   DIGITAL Techniques	DE87-096060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p. 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p. 12 A87-32493  Polar motion-induced gravity p. 15 A87-36176  Mapping from space p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p. 39 A87-38098  Surface models including direct cross-radiation - A simple model of furrowed surfaces p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances p. 40 A87-39198  Thematic Mapper bandpass solar exoatmospheric of the earth and of surface albedo using a physical model applied to Meteosat data p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions p. 47 A87-40756  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations p. 47 A87-40768  Satellite sensing of aerosol absorption p. 47 A87-40776  Physical principles of image convergence in remote ensing p. 40 A87-41925  Polarized views of the earth from orbital alitude
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelisat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images  Measurements on digitized hardcopy images  p. 39 A87-37290  Montane vegetation stratification processing of Landsat MSS data p. 9 A87-37290  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy: series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing multiresolution SPOT HRV and Landsat TM	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493. Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361. Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279. Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094. Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198. Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39199. Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246. Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40768. Satellite sensing of aerosol absorption. p. 47. A87-40768. Satellite sensing of aerosol absorption. p. 47. A87-40769. Physical principles of image convergence in remote sensing. p. 40. A87-41925. Polarized views of the earth from orbital allittude. p. 48. A87-42639.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers.  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements.  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images.  p. 39 A87-37290  Montane vegetation stratification processing of Landsat MSS data p. 9 A87-37290  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy. series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing p. 37 A87-35183  Merging multiresolution SPOT HRV and Landsat TM data p. 38 A87-37287	DE87-006060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. July 31-Aug 2, 1985, Proceedings Volumes 1 & 2  Polar motion-induced gravity p 15 A87-36176  EARTH SURFACE  Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493  Polar motion-induced gravity p 15 A87-36176  Mapping from space p 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements  p 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p 39 A87-38094  Comparison of HcMM and GOES satellite temperatures and evaluation of surface statistics p 39 A87-38094  Surface models including direct cross-radiation - A simple model of furrowed surfaces p 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data p 47 A87-40246 Simulations of the GOES visible sensor to changing surface and atmospheric conditions p 47 A87-40246 from satellite observations p 47 A87-40756  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations p 47 A87-40768  Satellite sensing of aerosol absorption p 47 A87-40770  Physical principles of image convergence in remote sensing p 40 A87-31925  Polarized views of the earth from orbital altitude p 48 A87-42639  Earth surface sensing in the '90's p 51 N87-24739
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers     NASA-TP-2643   p. 49 N87-22281     DEVELOPING NATIONS   Intelsat's small earth stations - Impact on the developing world p.56 A87-34799	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul., 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38098  Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39189  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40264  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations. p. 47. A87-40768  Satellite sensing of aerosol absorption. p. 47. A87-40768  Satellite sensing of aerosol absorption. p. 47. A87-40769  Physical principles of image convergence in remote sensing. p. 40. A87-41925  Polarized views of the earth from orbital altitude. p. 48. A87-42539  Earth surface sensing information Sciences Research Group.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelisat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images  Measurements on digitized hardcopy images  p. 39 A87-37290  Montane vegetation stratification processing of Landsat MSS data p. 9 A87-37290  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy: series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing p. 37 A87-35183  Merging multiresolution SPOT HRV and Landsat TM data  Comparison between digital and manual interpretation of high altitude aenal photographs p. 48 A87-32287	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493. Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361. Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279. Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094. Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198. Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39199. Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246. Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246. Satellite sensing of aerosol absorption. p. 47. A87-40768. Satellite sensing of aerosol absorption. p. 47. A87-40769. Satellite sensing of aerosol absorption. p. 47. A87-40769. Satellite sensing of aerosol absorption. p. 47. A87-40769. Satellite sensing of aerosol absorption. p. 48. A87-42639. Earth surface sensing in the '90's. p. 51. N87-24739. Remote Sensing information Sciences Research Group, year.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelisat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images  p. 39 A87-37290  Montane vegetation stratification processing of Landsat MSS data p. 9 A87-37290  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy: series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing  Merging multiresolution SPOT HRV and Landsat TM data  Comparison between digital and manual interpretation of high altitude aenal photographs p. 48 A87-32287  Optical and digital SAR processing techniques A statistical comparison of accuracy using SEASAT im 1997.	DE87-006060   p 41 N87-24014     EARTH CORE   Global images of the earth's interior   p 15 A87-37918     EARTH CRUST   Global images of the earth's interior   p 15 A87-37918     EARTH OBSERVATIONS (FROM SPACE)   Marine Observation Satellite-1 (MOS-1)   p 20 A87-32499     United States remote sensing satellites (RSSs) past, present, and future   p 56 A87-32502     Applied remote sensing Book   p 45 A87-33122     Derivation of a fast algorithm to account for distortions due to terrain in earth-viewing satellite sensor images   p 38 A87-35524     Measuring ocean waves from space; Proceedings of the Symposium, Johns Hopkins University, Laurel, MD, Apr 15-17, 1986   Spaceborne imaging radar research in the 1990s - An overview   p 46 A87-38837     Space remote sensors   p 47 A87-40379     Polarized views of the earth from orbital allitude   p 48 A87-42639     Proceedings of the European Symposium on Polar platform Opportunities   nd Instrumentation   for Remote-Sensing (ESPOIR)     ESA-SP-266    p 48 N87-20621     The Earth observation activities of the European Space Agency and the use of the polar platform of the International Space Station   p 49 N87-20634     Ocean-ice panel report International Space Station   p 30 N87-20635     Proceedings of the International Symposium on Progress in Imaging Sensors     ESA-SP-252    p 50 N87-24738     ESA-SP-252    p 50 N87-24738     Earth surface sensing in the '90's   p 51 N87-24739	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246  Satellite sensing of aerosol absorption. p. 47. A87-40768  Satellite sensing of aerosol absorption. p. 47. A87-40769  Satellite sensing of aerosol absorption. p. 47. A87-40769  Satellite sensing of aerosol absorption. p. 47. A87-40769  Satellite sensing in the '90's. p. 51. N87-24739  Remote Sensing Information Sciences Research Group, year. 4. INASA-CR-1810731. p. 43. N87-24817  EARTH TERMINALS.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers.  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements.  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images.  p. 39 A87-37279  Montane vegetation stratification processing of Landsat MSS data p. 9 A87-37290  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing metric magery multiresolution SPOT HRV and Landsat TM data p. 38 A87-37287  Comparison between digital and manual interpretation of high altitude aenal photographs p. 48 A87-32287  Optical and digital SAR processing techniques A statistical comparison of accuracy using SEASAT im egery  Digital data acquisition for close-range	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Juli, 31-Aug. 2, 1985. Proceedings: Volumes 1 & 2  Polar motion-induced gravity: p. 15 A87-36176  EARTH SURFACE: Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering: p. 12 A87-32493  Polar motion-induced gravity: p. 15 A87-36176  Mapping from space: p. 18 A87-36361  Computation: of diffuse sky irradiance from multidirectional radiance measurements: p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor: p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics: p. 39 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics: p. 39 A87-38098  Thematic Mapper bandpass solar exoatmospheric irradiances: p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances p. 40 A87-39189  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data: p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions: p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions: p. 47 A87-40756  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations: p. 47 A87-40768  Satellite sensing of aerosol absorption: p. 47 A87-40768  Satellite sensing of aerosol absorption: p. 47 A87-40769  Physical principles of image convergence in remote sensing: p. 40 A87-31925  Polarized views of the earth from orbital altitude: p. 48 A87-42639  Earth surface sensing in the '90's: p. 51 N87-24739  Remote Sensing Information Sciences Research Group, year: 44  [NASA-CR-181073]: p. 43 N87-24817  EARTH TERMINALS  Intelsat's small earth stations - Impact on the developing.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers.  INASA-TP-2643   p. 49 N87-22281  DEVELOPING NATIONS  Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements.  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37279  Montane vegetation stratification through digital processing of Landsat MSS data p. 9 A87-40302  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing p. 37 A87-35183  Merging multiresolution SPOT HRV and Landsat TM data p. 38 A87-37287  Comparison between digital and manual interpretation of high altitude aeral photographs p. 48 A87-32287  Optical and digital SAR processing techniques: A statistical comparison of accuracy using SEASAT im. gery p. 42 N87-24755  Digital data acquisition for close-rarige photogrammetry p. 45 N87-24785	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493  Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38094  Surface models including direct cross-radiation. A simple model of furrowed surfaces. p. 40. A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39189  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246  Satellite observations. p. 47. A87-40756  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations. p. 47. A87-40768  Satellite sensing of aerosol absorption. p. 47. A87-40768  Satellite sensing of aerosol absorption. p. 47. A87-40768  Satellite sensing in the '90's p. 51. N87-24739  Remote Sensing Information Sciences Research Group: Santa Barbara information Sciences Research Group; santa Barbara information Sciences Research Group; santa Barbara information Sciences Research Group; year. 4. [NASA-CR-181073] p. 43. N87-24817  EARTH TERMINALS  Intelsat's small earth stations - Impact on the developing world.
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers.  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelisat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements.  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments. p. 38 A87-37276  Measurements on digitized hardcopy images.  P. 39 A87-37276  Montane vegetation stratification processing of Landsat MSS data. p. 9 A87-37290  Montane vegetation stratification processing of Landsat MSS data. p. 9 A87-3020  DIGITAL RADAR SYSTEMS  Reports on cartography and geodesy. series 1. number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy. p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing. p. 37 A87-35183  Merging multiresolution SPOT HRV and Landsat TM data. p. 38 A87-37287  Comparison between digital and manual interpretation of high altitude aerial photographs. p. 48 A87-32287  Optical and digital SAR processing techniques. A statistical comparison of accuracy using SEASAT imagery. p. 42 N87-24753  Digital data acquisition for close-range photogrammetry.	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493. Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361. Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279. Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094. Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198. Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39189. Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192. Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246. Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246. Satellite sensing of aerosol absorption. p. 47. A87-40768. Satellite sensing of aerosol absorption. p. 47. A87-40768. Satellite sensing of aerosol absorption. p. 48. A87-42639. Earth surface sensing in the '90's. p. 51. N87-24739. Remote Sensing information Sciences Research Group. Santa Barbara information Sciences Research
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers.  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelsat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements.  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments p. 38 A87-37276  Measurements on digitized hardcopy images.  p. 39 A87-37279  Montane vegetation stratification processing of Landsat MSS data p. 9 A87-34002  DIGITAL RADAR SYSTEMS  Simulation software of synthetic aperture radar p. 37 A87-32506  DIGITAL SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing Merging multiresolution SPOT HRV and Landsat TM data p. 38 A87-37287  Comparison between digital and manual interpretation of high altitude aenal photographs p. 48 A87-3257  Optical and digital SAR processing techniques: A statistical comparison of accuracy using SEASAT im ingery p. 54 N87-24753  Digital data acquisition for close-range photogrammetry p. 54 N87-24785  DIRECTIVITY  Some approaches for comparing remote and in-situ	DE87-006060   p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985. Proceedings: Volumes 1 & 2  Polar motion-induced gravity: p. 15 A87-36176  EARTH SURFACE: Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering: p. 12 A87-32493  Polar motion-induced gravity: p. 15 A87-36176  Mapping from space: p. 38 A87-36361  Computation of diffuse sky irradiance from multidirectional radiance measurements: p. 6 A87-37279  Temporal observations of surface soil moisture using a passive microwave sensor: p. 7 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics: p. 39 A87-38094  Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics: p. 40 A87-39189  Thematic Mapper bandpass solar exoatmospheric irradiances: p. 40 A87-39189  Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data: p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions: p. 47 A87-40246  Simulations of the GOES visible sensor to changing surface and atmospheric conditions: p. 47 A87-40246  Satellite sensing of aerosol absorption: p. 47 A87-40768  Satellite sensing of aerosol absorption: p. 47 A87-40768  Satellite sensing of aerosol absorption: p. 47 A87-40769  Physical principles of image convergence in remote sensing: p. 40 A87-31925  Polarized views of the earth from orbital altitude: p. 48 A87-42639  Earth surface sensing in formation Sciences Research Group, year: 4  [NASA-CR-181073]: p. 43 N87-24817  EARTH TERMINALS: Intelsat's small earth stations: Impact on the developing world: p. 56 A87-34799  EARTH TERMINALS: Intelsat's small earth stations: Impact on the developing world: p. 56 A87-34799
DESERTS  Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers.  INASA-TP-2643] p. 49 N87-22281  DEVELOPING NATIONS Intelisat's small earth stations - Impact on the developing world p. 56 A87-34799  DIFFUSE RADIATION  Computation of diffuse sky irradiance from multidirectional radiance measurements.  p. 6 A87-37279  DIGITAL DATA  Combining panchromatic and multispectral imagery from dual resolution satellite instruments. p. 38 A87-37276  Measurements on digitized hardcopy images.  P. 39 A87-37276  Montane vegetation stratification processing of Landsat MSS data. p. 9 A87-37290  Montane vegetation stratification processing of Landsat MSS data. p. 9 A87-3020  DIGITAL RADAR SYSTEMS  Reports on cartography and geodesy. series 1. number 97  [ISSN-0469-4236] p. 16 N87-22286  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy. p. 53 N87-24768  DIGITAL TECHNIQUES  MIDAS - A new image-processing system for remote sensing. p. 37 A87-35183  Merging multiresolution SPOT HRV and Landsat TM data. p. 38 A87-37287  Comparison between digital and manual interpretation of high altitude aerial photographs. p. 48 A87-32287  Optical and digital SAR processing techniques. A statistical comparison of accuracy using SEASAT imagery. p. 42 N87-24753  Digital data acquisition for close-range photogrammetry.	DE87-006060  p 41 N87-24014	Terrestrial Reference Frame, Columbus, OH. Jul. 31-Aug. 2, 1985, Proceedings. Volumes 1 & 2  Polar motion-induced gravity. p. 15. A87-36176  EARTH SURFACE. Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering. p. 12. A87-32493. Polar motion-induced gravity. p. 15. A87-36176  Mapping from space. p. 38. A87-36361. Computation of diffuse sky irradiance from multidirectional radiance measurements. p. 6. A87-37279. Temporal observations of surface soil moisture using a passive microwave sensor. p. 7. A87-38094. Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics. p. 39. A87-38198. Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39189. Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192. Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data. p. 47. A87-40246. Simulations of the GOES visible sensor to changing surface and atmospheric conditions. p. 47. A87-40246. Satellite sensing of aerosol absorption. p. 47. A87-40768. Satellite sensing of aerosol absorption. p. 47. A87-40768. Satellite sensing of aerosol absorption. p. 48. A87-42639. Earth surface sensing in the '90's. p. 51. N87-24739. Remote Sensing information Sciences Research Group. Santa Barbara information Sciences Research

AVHRR data services in Europe . The Earthnet	A software defoliant for geological analysis of band ratios p 18 A67-39193	of the South Atlantic Bight
approach p 39 A87-37922	Error analysis of leaf area estimates made from	[DE87-005303] p 30 N87-20716
ECOLOGY	allometric regression models	FLOW GEOMETRY
Spectral classification of Landsat-5 Thematic Mapper	[NASA-TM-89220] p 11 N87-24010	West Antarctic ice streams draining into the Ross Ice
data p 37 A87-32488	New dimension analyses with error analysis for quaking	Shelf Configuration and mass balance p 19 A87-31592
Ten year change in forest succession and composition measured by remote sensing	aspen and black spruce (NASA-TM-89219) p 11 N87-24735	FLUORESCENCE
[NASA-CR-180948] p 11 N87-24736	[NASA-TM-89219] p 11 N87-24735 ERRORS	Sunlight induced 685 nm fluorescence imagery
ECONOMIC IMPACT	Simulation of wind gradient errors in NROSS (Navy	p 30 A87-42646
The impact of climate change from increased	Remote Ocean Sensing System) radar scatterometer data	Advanced imaging spectrometer for ocean
atmospheric carbon dioxide on American agriculture	in a simplified geometry	color/fluorescence measurements and further applications p 33 N87-24766
DOE/NBB-0077   p 11 N87-23032   ECONOMY	(AD-A175754) p 49 N87-20642	FLUX DENSITY
Arianespace top performance benefits ESA	Radial orbit error reduction and sea surface topography	A technique to estimate the ocean surface energy flux
p 57 N87-24493	determination using satellite altimetry [NASA-CR-180570] p 33 N87-24816	using VAS multispectral data p 30 N87-20710
ECOSYSTEMS	ERS-1 (ESA SATELLITE)	FOLIAGE
Spatial characterization of acid rain stress in Canadian Shield lakes	Earth resources satellite-1 (ERS-1) p 44 A87-32501	Error analysis of leaf area estimates made from allometric regression models
(NASA-CR-180982) p 36 N87-24032	The effect of receiver amplifier non-linearity on ERS-1	[NASA-TM-89220] p 11 N87-24010
EDGES	synthetic aperture radar imagery p 52 N87-24755	FORECASTING
Studies of the east Australian current off northern New	The first ESA remote sensing satellite (status and	An evaluation of the polar ice prediction system
South Wales	outlook) p 57 N87-24777	AD-A178522  p 41 N87-23014 FOREST FIRE DETECTION
[AD-A178461] p 32 N87-23103 EL NINO	ESTIMATES  A crop condition and crop yield estimation method based	Satellite detection of tropical burning in Brazil
A technique to estimate the ocean surface energy flux	on NOAA/VHRR satellite data p 10 N87-22280	p.8 A87-39191
using VAS multispectral data p 30 N87-20710	EUROPEAN PACE AGENCY	FOREST MANAGEMENT
Measurement and detection of precipitation. Satellite	The Earth observation activities of the European Space	Nadir looking airborne radar and possible applications
methods in the visible and the infrared p 36 N87-22364	Agency and the use of the polar platform of the	to forestry p.7. A87-38095 Ten year change in forest succession and composition
The 1982-1983 El Nino Atlas: Nimbus-7 microwave	International Space Station p 49 N87-20622	measured by remote sensing
radiometer data	EUROPEAN SPACE PROGRAMS  The Earth observation activities of the European Space	[NASA-CR-180948] p 11 N87-24736
[NASA-CR-180914] p 31 N87-22386	Agency and the use of the polar platform of the	FORESTS
The impact of initial conditions and SST Anomalies on	International Space Station p 49 N87-20622	Multipolarization SAR data for surface feature
extended range predictions for the El Nino period sea surface temperature (SST) p 32 N87-23046	European utilization aspects studies space stations	delineation and forest vegetation characterization p 1 A87-31411
ELECTRO-OPTICAL PHOTOGRAPHY	p 49 N87-20624	Continental land cover assessment using Landsat MSS
Investigation of simulated Monocular Electro-Optical	EVALUATION  An evaluation of the polar ice prediction system	data p 3 A87-32095
Stereo Scanner (MEOSS)-imagery for sensor navigation	[AD-A178522] p 41 N87-23014	Forest biomass, canopy structure, and species
and terrain derivation p 54 N87-24771  Earth observation experiments on the German Spacelab	EVAPOTRANSPIRATION	composition relationships with multipolarization L-band synthetic aperture radar data p 4 A87-35121
mission D2 p 55 N87-24811	Concerning the relationship between evapotranspiration and soil moisture p 8 A87-40244	A comparison of optical bar, high-altitude, and
The Monocular Electro-Optical Stereo Scanner	and soil moisture p 8 A87-40244  EXPERIMENT DESIGN	black-and-white photography in land classification
(MEOSS) satellite experiment p 55 N87-24812	Balloon-borne infrared multichannel radiometer for	p 4 A87-35122 Statistical evaluation of forest characteristics from aerial
The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuer	remote sensing of high resolution low-level water vapor	and space photographs p 5 A87-36109
Forschung und Technologie (BMFT). Milestones in the	fields p 43 A87-32477 Optimization of a program of experiments in connection	Reconnaissance of vegetal formations in a Guinean
development of an operational Earth Observation	with the operational planning of studies carried out with	forest sector by means of Landsat images
	with the operational planning of stocies carried out with	
system p 55 N87-24815	a spacecraft p 56 A87-34208	p 6 A87-36946 Airborne remote sensing of forest blomes
system p 55 N87-24815 ELECTRO-OPTICS	a spacecraft p 56 A87-34208 The observational objectives and the implementation	p 6 A87-36946 Airborne remote sensing of forest biomes p 9 A87-40301
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768	a spacecraft p 56 A87-34208 The observational objectives and the implementation	Airborne remote sensing of forest biomes p.9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE	Airborne remote sensing of forest biomes p.9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p.10 N87-22296 Error analysis of leaf area estimates made from allometric regression models
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628	Airborne remote sensing of forest biomes p.9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  [NASA-CR-180918] p.10 N87-22296  Error analysis of leaf area estimates made from allometric regression models  [NASA-TM-89220] p.11 N87-24010
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775	Airborne remote sensing of forest biomes p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high	Airborne remote sensing of forest biomes p.9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  [NASA-CR-180918] p.10 N87-22296  Error analysis of leaf area estimates made from allometric regression models  [NASA-TM-89220] p.11 N87-24010
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salimity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS  An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based	Airborne remote sensing of forest biomes p.9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p.10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p.11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p.11 N87-24593 Earth science research [NASA-CR-180512] p.11 N87-24733 New dimension analyses with error analysis for quaking
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS  An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph target permat Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings Remote sensing research in global agricultural	Airborne remote sensing of forest biomes  p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph target permat Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings Remote sensing research in global agricultural productivity p 2 A87-32008	Airborne remote sensing of forest biomes p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salimity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings Remote sensing research in global agricultural	Airborne remote sensing of forest biomes p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salimity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION  Environmental protection from space	a spacecraft The observational objectives and the implementation of the Global Weather Experiment P 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery P 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude F  FARM CROPS Signature-extendable technology - Global space-based crop recognition P 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings P 1 A87-32007 Remote sensing research in global aproductivity Remote sensing methods of yield forecasting P 2 A87-32008 Evaluation of a surface/vegetation parameterization	Airborne remote sensing of forest biomes p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986. Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature	Airborne remote sensing of forest biomes p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431  FRENCH SPACE PROGRAMS
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS  An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE  Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS  Signature-extendable technology - Global space-based crop recognition p 1 A87-31414  Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007  Remote sensing research in global agricultural productivity p 2 A87-32008  Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Determination of spectral reflectance of crops during	Airborne remote sensing of forest biomes  p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean  p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program p 20 A87-32503
system  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION  Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING  Remote sensing research in global agricultural	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32008 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503
system  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight (DE87-005303) p 30 N87-20716  ENVIRONMENT PROTECTION  Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING  Remote sensing research in global agricultural productivity p 2 A87-32098  The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32008 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801	Airborne remote sensing of forest biomes  p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean  p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program p 20 A87-32503
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32008  The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210  The possibility of using satellite measurements of	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32008 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503 FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture
system p 55 N87-24815  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION  Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING  Remote sensing research in global agricultural productivity p 2 A87-32200  The Netherlands-Indonesian remote-sensing satellite TERS  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32008 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503 FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32008  The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210  The possibility of using satellite measurements of	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings Remote sensing research in global agricultural productivity p 2 A87-32007 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503 FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture radars
system  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303]  ENVIRONMENT PROTECTION  Environmental protection from space  ENVIRONMENTAL MONITORING  Remote sensing research in global agricultural productivity p 2 A87-32008  The Netherlands-Indonesian remote-sensing satellite TERS  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environment	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32008 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-3298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-33310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952	Airborne remote sensing of forest biomes  p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program p 20 A87-32503  FREQUENCY MODULATION  Multilook images of ocean waves by synthetic aperture radars p 28 A87-41068
System  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph target promat Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION  Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING  Remote sensing research in global agricultural productivity p 2 A87-32008  The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environment Surveys	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings Remote sensing research in global agricultural productivity p 2 A87-32007 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in	Airborne remote sensing of forest biomes p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program p 20 A87-32503  FREQUENCY MODULATION  Multilook images of ocean waves by synthetic aperture radars p 28 A87-41068  G  GAS EXCHANGE  Trace gas exchanges and transports over the
System  ELECTRO-OPTICS  The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Atlantic Bight (DE87-005303) p 30 N87-20716  ENVIRONMENT PROTECTION  Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING  Remote sensing research in global agricultural productivity p 2 A87-32098  The Netherlands-Indonesian remote-sensing satellite TERS  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environment p 14 A87-39593  ENVIRONMENTAL SURVEYS  Spectral classification of Landsat-5 Thematic Mapper	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986. Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32008 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183	Airborne remote sensing of forest biomes  p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean  p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program  p 20 A67-32503  FREQUENCY MODULATION  Multilook images of ocean waves by synthetic aperture radars  p 28 A87-41068
System p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph target Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32008 The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environment p 14 A87-39593  ENVIRONMENTAL SURVEYS Spectral classification of Landsat-5 Thematic Mapper data	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  F  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24733 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503 FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture radars p 28 A87-41068  G GAS EXCHANGE Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 GAS TRANSPORT
System  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION  A study of elevation measurement using LFC photograph targe Format Camera p 43 A87-32491  EMISSIVITY  Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER  Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION  Continental shelf processes affecting the oceanography of the South Altantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION  Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING  Remote sensing research in global agricultural productivity p 2 A87-32008  The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environment environment p 14 A87-39593  ENVIRONMENTAL SURVEYS  Spectral classification of Landsat-5 Thematic Mapper data  EPIDEMIOLOGY  Detection of Rift Valley fever viral activity in Kenya by	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183  FLIR DETECTORS An expert system for labeling segments in forward	Airborne remote sensing of forest biomes  p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean  p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program  p 20 A67-32503  FREQUENCY MODULATION  Multilook images of ocean waves by synthetic aperture radars  p 28 A87-41068
System p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph target Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32008 The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210 The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125 Strategies and technologies for monitoring the environment p 14 A87-39593  ENVIRONMENTAL SURVEYS Spectral classification of Landsat-5 Thematic Mapper data  EPIDEMIOLOGY Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A17-37827	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-3510  FINLAND Applications of satellite microwave radiometry in Finland Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183  FLIR DETECTORS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628	Airborne remote sensing of forest biomes p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program p 20 A87-32503  FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture radars p 28 A87-41068  G  GAS EXCHANGE  Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196  GAS TRANSPORT  Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196  GAS-LIQUID INTERACTIONS
System p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight (DE87-005303) p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32200  The Netherlands-Indonesian remote-sensing satellite productivity p 2 A87-32210  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environment p 14 A87-39593  ENVIRONMENTAL SURVEYS Spectral classification of Landsat-5 Thematic Mapper data  EPIDEMIOLOGY Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A67-3248	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings Remote sensing research in global agricultural productivity p 2 A87-32007 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183  FLIR DETECTORS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  FLOOD DAMAGE Monsoon flood boundary delineation and damage	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503 FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture radars p 28 A87-41068  G  GAS EXCHANGE Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 GAS TRANSPORT Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 GAS-LIQUID INTERACTIONS Wind and nadir angle effects on airborne lidar water
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph target Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32210  The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environmental classification of Landsat-5 Thematic Mapper data p 37 A87-32488  EPIDEMIOLOGY Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A07-37827  EQUATORIAL REGIONS Long waves in the equatorial Atlantic Ocean during	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high attitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986. Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32008 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-32298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183  FLIR DETECTORS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  FLOOD DAMAGE Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsat	Airborne remote sensing of forest biomes  p 9 A87-40301  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296  Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010  Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593  Earth science research [NASA-CR-180512] p 11 N87-24733  New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735  Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736  FREE ATMOSPHERE  Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean  p 21 A87-33431  FRENCH SPACE PROGRAMS  The French Space Oceanography Program  p 20 A87-32503  FREQUENCY MODULATION  Multilook images of ocean waves by synthetic aperture radars  p 28 A87-41068  G  GAS EXCHANGE  Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196  GAS TRANSPORT  Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196  GAS-LIQUID INTERACTIONS  Wind and nadir angle effects on airborne lidar water 'surface' returns p 29 A87-42641
system p 55 N87-24815  ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph target Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight [DE87-005303] p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32210  The Netherlands-Indonesian remote-sensing satellite TERS p 43 A87-32210  The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environmental classification of Landsat-5 Thematic Mapper data p 37 A87-32488  EPIDEMIOLOGY Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A07-37827  EQUATORIAL REGIONS Long waves in the equatorial Atlantic Ocean during	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings Remote sensing research in global agricultural productivity p 2 A87-32007 Remote sensing methods of yield forecasting p 2 A87-32009  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183  FLIR DETECTORS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  FLOOD DAMAGE Monsoon flood boundary delineation and damage	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503 FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture radars p 28 A87-41068  G  GAS EXCHANGE Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 GAS TRANSPORT Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 GAS-LIQUID INTERACTIONS Wind and nadir angle effects on airborne lidar water
ELECTRO-OPTICS The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768  ELEVATION A study of elevation measurement using LFC photograph target Format Camera p 43 A87-32491  EMISSIVITY Measurement of the surface emissivity of turbid waters p 19 A87-32097  Salinity effects on the microwave emission of soils p 5 A87-35520  ENERGY TRANSFER Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during winter p 31 N87-21980  ENVIRONMENT POLLUTION Continental shelf processes affecting the oceanography of the South Atlantic Bight (DE87-005303) p 30 N87-20716  ENVIRONMENT PROTECTION Environmental protection from space p 13 A87-36363  ENVIRONMENTAL MONITORING Remote sensing research in global agricultural productivity p 2 A87-32098 The Netherlands-Indonesian remote-sensing satellite TERS The Netherlands-Indonesian remote-sensing satellite p 43 A87-32210 The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125  Strategies and technologies for monitoring the environment p 14 A87-39593  ENVIRONMENTAL SURVEYS Spectral classification of Landsat-5 Thematic Mapper data  EPIDEMIOLOGY Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A07-37827  EQUATORIAL REGIONS Long waves in the equatorial Atlantic Ocean during 1983 p 23 A87-37564	a spacecraft p 56 A87-34208 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474  EXPERT SYSTEMS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  EXPOSURE Exposure test with high resolution films from high altitude p 54 N87-24775  FARM CROPS Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, Proceedings p 1 A87-32007 Remote sensing research in global agricultural productivity p 2 A87-32008 Remote sensing methods of yield forecasting p 2 A87-32009 Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298 Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801  FARMLANDS Some observations on crop profile modelling p 5 A87-35310  FINLAND Applications of satellite microwave radiometry in Finland p 44 A87-32952  FLIGHT TESTS The Tethered Satellite System as a new remote sensing platform p 46 A87-39183  FLIR DETECTORS An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628  FLOOD DAMAGE Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsat data	Airborne remote sensing of forest biomes p 9 A87-40301 Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296 Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010 Measured radar return at the near vertical from forested terrains [DE87-009384] p 11 N87-24593 Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Ten year change in forest succession and composition measured by remote sensing [NASA-CR-180948] p 11 N87-24736 FREE ATMOSPHERE Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean p 21 A87-33431 FRENCH SPACE PROGRAMS The French Space Oceanography Program p 20 A87-32503 FREQUENCY MODULATION Multilook images of ocean waves by synthetic aperture radars p 28 A87-41068  G  GAS EXCHANGE Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 GAS TRANSPORT Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 GAS-LIQUID INTERACTIONS Wind and nadir angle effects on airborne lidar water surface returns p 29 A87-42641 GEOCHRONOLOGY

a	E	n	n	E	e	٧

Report on the Special Program 78 satellite geodesy of the Technical University of Munich

[ASTRON-GEODAET-ARB-48] p 16 N87-20618 Reports on cartography and geodesy, series 1, number

HSSN-0469-42361 p 16 N87-22282 Reports on cartography and geodesy, series 1, number

[ISSN-0469-4236] p 16 N87-22286

#### GEODETIC COORDINATES

investigation of tectonic deformations using global satellite laser ranging data p 14 A87-33375 Report on the Special Program 78 satellite geodesy of the Technical University of Munich

p 16 N87-20618 (ASTRON-GEODAET-ARB-48)

#### GEODETIC SATELLITES

The Geosat altimeter mission - A milestone in satellite p 27 A87-40281 oceanography Using the Global Positioning System (GPS) for high precision geodetic surveys - Highlights and problem p 16 A87-41383 areas

#### **GEODETIC SURVEYS**

Investigation of tectonic deformations using global p 14 A87-33375 satellite laser ranging data

GINFEST - Geodetic intercomparison network for p 15 A87-36164 evaluating space techniques Creation of a global geodetic network using Mark III p 15 A87-36166 Using the Global Positioning System (GPS) for high

precision geodetic surveys - Highlights and problem p 16 A87-41383 areas Altimeter measurements for the determination of the

Earth's gravity field I NASA-CR-180520 I p 17 N87-23033

#### GEODYNAMICS

Global images of the earth's interior

p 15 A87-37918

#### **GEOGRAPHIC INFORMATION SYSTEMS**

Preliminary report on the development of marine geographic information systems p 23 A87-37056 The Geomulti database management system

p 39 A87-37802

#### **GEOIDS**

Altimeter measurements for the determination of the Earth's gravity field

p 17 N87-23033 Radial orbit error reduction and sea surface topography determination using satellite altimetry

p 33 N87-24816

### **GEOLOGICAL FAULTS**

The geostructural characteristics of the rift zone on the Lambert glacier (Antarctica) according to space images

p 18 A87-36105 Fault patterns by space remote sensing and the rotation of western Oregon during Cenozoic times

p 18 A87-36525 LANDSAT-based lineament analysis, East Texas Basin, and structural history of the Sabine Uplift area, East Texas and North Louisiana

[PB87-176327] p 19 N87-24043

### GEOLOGICAL SURVEYS

Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p 17 A87-31410 The geometry of the intersections of tectonic structures p 17 A87-36104 detected on satellite images A software defoliant for geological analysis of band p 18 A87-39193

Spacelab data - A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790

Radar as a complement to topographic maps for delineating marine terraces

p 41 N87-24013 LPR87-1545971

### GEOMAGNETISM

Exploration of geomagnetic field anomaly with balloon or geophysical research p 17 A87-32478 for geophysical research GEOMETRIC ACCURACY

Introduction of geometric information to radar image p 42 N87-24754 **GEOMETRIC RECTIFICATION (IMAGERY)** 

Derivation of a fast algorithm to account for distortions due to terrain in earth-viewing satellite sensor images

p 38 A87-35524 Stereoscopic line scan imaging and satellite control [DGLR PAPER 86-106] p 38 A87-36757 Multisatellite data processing p 39 A87-37803 Rectification of terrain induced distortions in radai p 48 A87-42254 Aerial triangulation of CCD line-scanner images

p 54 N87-24769

### **GEOMETRICAL OPTICS**

Geometrical system calibration, especially for metric p 51 N87-24745

#### GEOMORPHOLOGY

Geochronological studies of strandlines of Saurashtra india, detected by remote sensing techniques

p 15 A87-35308

A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428 GEOPOTENTIAL

A new covariance model for inertial gravimetry and p 14 A87-31591 gradiometry

#### GLACIERS

Development of a satellite remote sensing technique or the study of alpine glaciers p 34 A87-35311 for the study of alpine glaciers The geostructural characteristics of the rift zone on the Lambert glacier (Antarctica) according to space images

GLOBAL ATMOSPHERIC RESEARCH PROGRAM

Convective heating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982

Impact of satellite-based data on FGGE general circulation statistics p 44 A87-32985 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474 Remotely sensed sea surface temperature for the Alpine Experiment (ALPEX) --- AVHRR-2 data

#### n 30 N87-21497 GLOBAL POSITIONING SYSTEM

Aerotriangulation without ground control

p 46 A87-37289 GPS-based geodesy in California, Mexico and the Caribbean p 16 A87-41380 Using the Global Positioning System (GPS) for high precision geodetic surveys - Highlights and problem p 16 A87-41383 areas Application of Global Positioning System (GPS) ivers for Earth observation p 53 N87-24763

GOES SATELLITES

Determining rainfall intensity and type from GOES imagery in the midlatitudes p 34 AE7-32092 Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method

p 8 A87-40248

Simulations of the GOES visible sensor to changing p 47 A87-40756 surface and atmospheric conditions **GOVERNMENT/INDUSTRY RELATIONS** 

The role of government specifications in aerial p 57 N87-24780 photography

GRASSLANDS Reflectance characteristics and its application in the

classification of Nigerian Savanna soils

p 3 A87-32954 Some observations on crop profile modelling

p 5 A87-35310

p 15 A87-36176

### GRAVIMETRY

A new covariance model for inertial gravimetry and p 14 A87-31591

**GRAVITATIONAL FIELDS** 

Altimeter measurements for the determination of the Earth's gravity field

INASA-CR-1805201 p 17 N87-23033 **GRAVITY ANOMALIES** 

Polar motion-induced gravity

GRAVITY GRADIOMETERS A new covariance model for inertial gravimetry and p 14 A87-31591

gradiometry
GRAVITY WAVES

The propagation of short surface waves on longer gravity p 28 A87-40835

### **GREENLAND**

An evaluation of the polar ice prediction system [AD-A178522]

p 41 N87-23014

### **GROUND STATIONS**

GINFEST - Geodetic intercomparison network for evaluating space techniques p 15 A87-36164 Creation of a global geodetic network using Mark III p 15 A87-36166 VLBI

### **GROUND TRUTH**

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation --- Global Tropospheric Experiment/Chemical Instrumentation Test and Evaluation p 45 A87-33426

Cloud-cover and precipitation patterns over the Republic of Guinea according to ground-based and satellite p 35 A87-36102 observations

Earth science research

(NASA-CR-180512) p 11 N87-24733

### GROUND WATER

Satellite techniques for studying ice crusts and underground waters in the eastern Pamii p 35 A87-36106

**GYRES** 

Determination of the velocity of ocean gyres through A87-35314 Synthetic Aperture Radar

### **HABITATS**

Habitat mapping by Landsat for aerial census of p 2 A87-32094 kangaroos

### HARMONIC FUNCTIONS

Biharmonic spline interpolation of GEOS-3 and Seasat p 20 A87-32770 altimeter data

#### HAZE

Satellite sensing of aerosol absorption

p 47 A87-40770

### HEAT CAPACITY MAPPING MISSION

Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p 39 A87-38098 HEAT FLUX

A technique to estimate the ocean surface energy flux p 30 N87-20710 using VAS multispectral data

#### **HEAT TRANSFER**

Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during p 31 N87-21980

#### HELICOPTERS

Measured radar return at the near vertical from forested terrains

[DE87-009384] p 11 N87-24593

### HIGH ALTITUDE

Comparison between digital and manual interpretation p 48 A87-42257 of high altitude aerial photographs

#### HIGH ALTITUDE TESTS

Exposure test with high resolution films from high p 54 N87-24775

### HIGH RESOLUTION

Exposure test with high resolution films from high p 54 N87-24775 altitude

p 54 N87-24776 Very high resolution aerial films

#### HISTOGRAMS

Introduction of initial centers for the algorithm of clustering around mobile centers --- in multispectral image classification p 37 A87-35313

### HORIZON SCANNERS

Infrared Earth horizon sensor concepts in various p 52 N87-24752 spectral bands

#### HURRICANES

Satellite measurements of sea surface cooling during hurricane Gloria p 24 A87-37886 The age and source of ocean swell observed in p 25 A87-38843 Hurricane Josephine

### **HYDROGRAPHY**

Aircraft radiopositioning for airborne photography during p 23 A87-36945 hydrographic coastal surveys Optical dynamics experiment (ODEX) data report R/V acania expedition 10 October-17 November 1982. Volume 2: Particle size distributions. Volume 6: Scalar spectral-radiometer data

IAD-A178535 p 32 N87-23104

### HYDROLOGY

Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103 Satellite techniques for studying ice crusts and

underground waters in the eastern Pamir p 35 A87-36106 Remote sensing applications in hydrology

p 35 A87-40308 Recent research in snow hydrology

p 35 A87-40309 Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies Test site: Pantanal Region (Brazil/Paraguay)

### HYDROXYL RADICALS

OH measurement near the intertropical convergence p 21 A87-33430 zone in the Pacific

### ICE ENVIRONMENTS

An evaluation of the polar ice prediction system [AD-A178522] p 41 N87 p 41 N87-23014

### ICE FORMATION

An evaluation of the polar ice prediction system [AD-A178522] p 41 N87-23014

ICE MAPPING

Remote sensing as a research tool --- sea ice surveillance from aircraft and spacecraft

p 28 A87-40648 Statistical description of the summertime ice edge in the Chukchi Sea, task 2

p 31 N87-22387 [DE87-001056] Arctic Sea ice, 1973-1976: Satellite passive-microwave observations

(NASA-SP-489) p 33 N87-24870

p 52 N87-24748

ICE REPORTING	Optical and digital SAR processing techniques A	INFRARED RADIATION
Ocean-ice panel report International Space Station	statistical comparison of accuracy using SEASAT	GLAI estimation using measurements of red near
р 30 N87-20635	magery p 42 N87-24753	infrared, and middle infrared radiance p.4. A87-35119
An evaluation of the polar ice prediction system	Introduction of geometric information to radar image	Mid-infrared remote sensing systems and their
AD-A178522  p.41 N87-23014	data p 42 N87-24754	application to lithologic mapping p 17 A87-35522
IMAGE ANALYSIS	Investigation of simulated Monocular Electro-Optical	Polarized views of the earth from orbital altitude
Reflectance characteristics and its application in the	Stereo Scanner (MEOSS)-imagery for sensor navigation	p 48 A87 42639
classification of Nigerian Savanna soils	and terrain derivation p 54 N87-24771	INFRARED RADIOMETERS
p 3 A87 32954	The use of auxiliary date in photogrammetric	Measurement of the surface emissivity of turbid
Development of a satellite remote sensing technique	adjustments p 42 N87-24808	waters p 19 A87 32097
for the study of alpine glaciers p 34 A87-35311	IMAGE RECONSTRUCTION	Balloon borne infrared multichannel radiometer for
introduction of initial centers for the algorithm of	Determination of the velocity of ocean gyres through	remote sensing of high resolution low-level water vapor
clustering around mobile centers in multispectral image	Synthetic Aperture Radar p 22 A87-35314	fields p 43 A87 32477
classification p 37 A87-35313	Stereoscopic line scan imaging and satellite control	Deforestation in the tropics - New measurements in the
Rapid analysis of satellite radar images of sea ice	[DGLR PAPER 86-106] p 38 A87-36757	Amazon Basin using Landsat and NOAA advanced very
p 22 A87-35873	· · · · · · · · · · · · · · · · · · ·	high resolution radiometer imagery p.4. A87:33441
What, where, when, why? Extracting information from	IMAGE RESOLUTION	Soil moisture estimation using GOES-VISSR infrared
remote sensing data p 46 A87-37055	On the matching of resolution in aerial photographic	data - A case study with a simple statistical method
Measurements on digitized hardcopy images	systems p 54 N87-24773	p.8 A87-40248
p 39 A87-37290	Very high resolution aerial films p 54 N87-24776	INFRARED SCANNERS
Surface models including direct cross-radiation - A	The RMK aerial camera system. Performance potential	infrared Earth horizon sensor concepts in various
simple model of furrowed surfaces p 40 A87-39189	of aerial photography with forward motion compensation	spectral bands p 52 N87-24752
Comparative analysis of Thematic Mapper and SPOT	p 54 N87-24781	INFRARED SPECTRA
image data for land use investigation p.51 N87-24746	SPOT image quality p 42 N87-24804	Measurement and detection of precipitation. Satellite
Large format camera image analysis for mapping of land	Image quality problems in practical aerial photography	methods in the visible and the infrared
use patterns in the region Noale - Musone, Po-River-Plain,	p 43 N87-24814	p 36 N87-22364
North Italy p 55 N87-24789	IMAGING RADAR	INLAND WATERS
IMAGE ENHANCEMENT	Wave-measurement capabilities of the surface contour	Inland wetland change detection using aircraft MSS
Landsat image enhancement study of possible		· · · · · · · · · · · · · · · · · · ·
submerged sand-dunes in the Arabian Gulf	radar and the airborne oceanographic lidar p. 25 A87-38840	·
p 22 A87-35315	F = 1	INSOLATION
A software defoliant for geological analysis of band	IMAGING SPECTROMETERS	An evaluation of satellite-based insolation estimates for
ratios p 18 A87-39193	The Radar Ocean-Wave Spectrometer	Ohio p 34 A87-33297
Improvement of image quality by forward motion	p 25 A87 38846	INSTRUMENT ORIENTATION
compensation, a preliminary report p 42 N87-24741	Remote sensing of coastal wetlands	The use of camera orientation data in photogrammetry
IMAGE MOTION COMPENSATION	p 9 A87-40944	A review p 52 N87-24749
Improvement of image quality by forward motion	Evaluation of the airborne imaging spectrometer for	The offects of camera position and attitude data in aerial
compensation, a preliminary report p 42 N87-24741	remote sensing of forest stand conditions	triangulation, a simulation study p 52 N87-24750
On the matching of resolution in aerial photographic	[NASA-CR-180918] p 10 N87-22296	INTELSAT SATELLITES
systems p 54 N87-24773	IMAGING TECHNIQUES	Intelsat's small earth stations - Impact on the developing
The RMK aerial camera system. Performance potential	Sensors for imaging p 45 A87-36360	world p 56 A87-34799
of aerial photography with forward motion compensation	NASA/MSFC large stretch press study	INTERNAL WAVES
p 54 N87-24781	[NASA-CR-180376] p 41 N87-20554	Surface manifestations of hydrophysical processes in
Wild Aviophot (TM) RC20 aerial camera system. The	Optical Transfer Function (OTF)-based quality criteria	the Strait of Gibraltar according to 'Salyut-6'
other approach to image motion compensation in aerial	for aerial cameras and imaging systems	photographs p 35 A87-36103
photography p 54 N87-24782	p 51 N87-24742	. • .
IMAGE PROCESSING	INDIA	The SIR-B mission. Towards an understanding of internal
MIDAS - A new image-processing system for remote	Indian remote sensing programme p 56 A87-32955	waves in the ocean
sensing p 37 A87-35183	INDIAN OCEAN	[ARE-TR-86122] p 32 N87-23102
The regression intersection method of adjusting image	Tidal estimation in the Atlantic and Indian Oceans, 3	INTERNATIONAL COOPERATION
data for band ratioing p 45 A87-35306	deg x 3 deg solution	Proceedings of the European Symposium on Polar
The topographic effect on Landsat data in gently	[NASA-TM-87812] p.30 N87-21534	platform Opportunities and Instrumentation for
undulating terrain in southern Sweden p 4 A87-35307	INDONESIAN SPACE PROGRAM	Remote-Sensing (ESPOIR)
Some observations on crop profile modelling	The Netherlands-Indonesian remote-sensing satellite	[ESA-SP-266] p 48 N87-20621
p 5 A87-35310	TERS p 43 A87-32210	INTERPLANETARY SPACECRAFT
Landform investigation utilizing digitally processed	INERTIA	Modern CCD sensors and their applications in Earth
	A new covariance model for inertial gravimetry and	observation and planetary missions p 55 N87-24813
	gradiometry p 14 A87-31591	INTERPOLATION
Merging multiresolution SPOT HRV and Landsat TM	INERTIAL NAVIGATION	Biharmonic spline interpolation of GEOS-3 and Seasat
4-4-	MENTIAL MATIGATION	altimeter data p 20 A87-32770
data p 38 A87-37287	The use of camera equations date in photogrammetry	Simulation of wind gradient errors in NROSS (Navy
Image preprocessing for line detection based on local	The use of camera orientation data in photogrammetry	
·	A review p 52 N87-24749	
Image preprocessing for line detection based on local	A review p.52 N87-24749 The use of auxiliary date in photogrammetric	Remote Ocean Sensing System) radar scatterometer data
Image preprocessing for line detection based on local structure analysis p 39 A87-37801	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Multisatellite data processing p 39 A87-37803	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p 49 N87-20642
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925	A review p 52 N87-24749  The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS  Reports on cartography and geodesy, series 1, number	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Multisatellite data processing p 39 A87-37803 Physical principles of image convergence in remote	A review p 52 N87-24749  The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS  Reports on cartography and geodesy, series 1, number 97	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Multisatellite data processing p 39 A87-37803 Physical principles of image convergence in remote sensing p 40 A87-41925 Optical image subtraction techniques, 1975-1985 p 40 A87-42659	A review p 52 N87-24749 The use of auxiliary date in photogrammetric p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Multisatellite data processing p 39 A87-37803 Physical principles of image convergence in remote sensing p 40 A87-41925 Optical image subtraction techniques, 1975-1985	A review p 52 N87-24749  The use of auxiliary date in photogrammetric p 42 N87-24808  INFORMATION SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286  Quick-look guide to the crustal dynamics project's data	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925 Optical image subtraction techniques, 1975-1985 p. 40 A87-42659 Reports on cartography and geodesy, series 1, number 97	A review p 52 N87-24749 The use of auxiliary date in photogrammetric p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  IISSN-0469-4236   p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Multisatellite data processing p 39 A87-37803 Physical principles of image convergence in remote sensing p 40 A87-41925 Optical image subtraction techniques, 1975-1985 p 40 A87-42659 Reports on cartography and geodesy, series 1, number 97	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 IISSN-0469-4236   p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-332982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Multisatellite data processing p 39 A87-37803 Physical principles of image convergence in remote sensing p 40 A87-41925 Optical image subtraction techniques, 1975-1985 p 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 The VICOM system for digital image processing at the	A review The use of auxiliary date in photogrammetric p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286  Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018  Remote Sensing Information Sciences Research Group	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430 IRRADIANCE
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925 Optical image subtraction techniques, 1975-1985 p. 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 IISSN-0469-4236   p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430 IRRADIANCE  Computation of diffuse sky irradiance from
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925 Optical image subtraction techniques, 1975-1985 p. 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16 N87-22290	A review p 52 N87-24749 The use of auxificity date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  IISSN-0469-4236 p p 16 N87-22286	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430 IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Multisatellite data processing p 39 A87-37803 Physical principles of image convergence in remote sensing p 40 A87-41925 Optical image subtraction techniques, 1975-1985 p 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p 16 N87-22290 The integration of spectral and spatial analysis for land	A review The use of auxiliary date in photogrammetric p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Guick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430 IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97.  [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification.	A review p 52 N87-24749 The use of auxiliary date in photogrammetric p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system  INASA-TM-87818  p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4  [NASA-CR-181073  p 43 N87-24817  INFORMATION THEORY	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430 IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925 Optical image subtraction techniques, 1975-1985 p. 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16 N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14 N87-23015	A review p 52 N87-24749 The use of auxifery date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group, santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430 IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p 6 A87-37279 IRRIGATION  Influence of different nitrogen and irrigation treatments
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925 Optical image subtraction techniques, 1975-1985 p. 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-2286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16 N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14 N87-23015 An atmospheric correction algorithm for remote	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-2280	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430 IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279 IRRIGATION
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of	A review p 5.2 N87-24749  The use of auxiliary date in photogrammetric adjustments in p. 42 N87-24808  INFORMATION SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286  Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018  Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4  [NASA-CR-181073] p 43 N87-24817  INFORMATION THEORY  A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-2280  INFRARED DETECTORS	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430 IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p 6 A87-37279 IRRIGATION  Influence of different nitrogen and irrigation treatments
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity.	A review p 52 N87-24749 The use of auxifery date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group, santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHER satellite data p 10 N87-22280 INFARED DETECTORS Atmospheric remote sensing in arctic regions	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430 IRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Peports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280 INFRARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979.  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925 Optical image subtraction techniques, 1975-1985 p. 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16 N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14 N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-066059] p. 41 N87-24011 Utilizing remote sensing of thematic mapper data to	A review p 5.2 N87-24749  The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286  Guick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018  Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4  [NASA-CR-181073] p 43 N87-24817  INFORMATION THEORY  A crop condition and crop yield estimation method based on NOAA/AVHIRP satellite data p 10 N87-22280  INFRARED DETECTORS  Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012  INFRARED FILTERS	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32990  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Peports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011	A review p. 52 N87-24749 The use of auxifery date in photogrammetric adjustments p. 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p. 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p. 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHER satellite data p. 10 N87-22280 INFRARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p. 50 N87-23012 INFARED FILTERS Ground and aerial use of an infrared video camera with	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image
Image preprocessing for line detection based on local structure analysis p. 39 A87-37801 Multisatellite data processing p. 39 A87-37803 Physical principles of image convergence in remote sensing p. 40 A87-41925 Optical image subtraction techniques, 1975-1985 p. 40 A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16 N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14 N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-066059] p. 41 N87-24011 Utilizing remote sensing of thematic mapper data to	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286 Cuick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4  [NASA-CR-181073] p 43 N87-24817  INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280  INFRARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012  INFRARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2 0 microns)	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine-dependent fisheries	A review p 5.2 N87-24749  The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286  Ouick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018  Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4  [NASA-CR-181073] p 43 N87-24817  INFORMATION THEORY  A crop condition and crop yield estimation method based on NOAA/AVHIRP satellite data p 10 N87-22280  INFRARED DETECTORS  Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012  INFRARED FILTERS  Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2.0 microns)  p 48 A87-41588	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine-dependent	A review p 52 N87-24749 The use of auxificity date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280 INFARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012 INFARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 20 microns)  [NFARED IMAGERY]	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97.  [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An almospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries.	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 IISSN-0469-4236 p p 16 N87-22286	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine-dependent fisheries	A review p 5.2 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-22018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHIRR satellite data p 10 N87-22280 INFRARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012 INFRARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2 0 microns) p 48 A87-41588 INFRARED IMAGERY Remote sensing as a research tool ··· sea ice surveillance from aircraft and spacecraft	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification p. 37 A87-35313
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801  Multisatellite data processing p. 39—A87-37803  Physical principles of image convergence in remote sensing p. 40—A87-41925  Optical image subtraction techniques, 1975-1985 p. 40—A87-42659  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p. 16—N87-22286  The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290  The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015  An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011  Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries [NASA-CR-180984] p. 33—N87-24012  Earth science research [NASA-CR-180512] p. 11—N87-24733	A review p. 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p. 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p. 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p. 43 N87-24817  INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHER satellite data p. 10 N87-2280  INFRARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p. 50 N87-23012  INFARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1.45 to 2.0 microns)  p. 48 A87-41588  INFRARED IMAGERY Remote sensing as a research tool sea ice surveillance from aircraft and spacecraft	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification p. 37 A87-35313
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985. p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97.  [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries.  [NASA-CR-180984] p. 33—N87-24012 Earth science research [NASA-CR-180512] p. 11—N87-24733 Optical Transfer Function (OTF)-based quality criteria.	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 IISSN-0469-4236 p p 16 N87-22286	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective reating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements p 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification p 37 A87-35313  JAPAN  Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p 20 A87-32497
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37801 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22280 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range oi validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries [NASA-CR-180984] p. 33—N87-24012 Earth science research [NASA-CR-180512] p. 11—N87-24733 Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Cuick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-22018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280 INFRARED DETECTORS Almospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012 INFRARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2 0 microns) p 48 A87-41588 INFRARED IMAGERY Remote sensing as a research tool sea ice surveillance from aircraft and spacecraft p 28 A87-40648 An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification  Japan  Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p. 20 A87-32497  JAPANESE SPACECRAFT
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37801 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries [NASA-CR-180984] p. 33—N87-24012 Earth science research [NASA-CR-180912] p. 11—N87-24733 Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280 INFARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012 INFRARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2 0 microns) p 48 A87-41588 INFRARED IMAGERY Remote sensing as a research tool ··· sea ice surveillance from aircraft and spacecraft p 28 A87-40648 An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628 Definition of a thermal infrared pushbroom imager for	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p 49 N87-20642 INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements p 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32990  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification p 37 A87-35313  JAPAN  Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p 20 A87-32497  JAPANESE SPACECRAFT  Manne Observation Satellite-1 (MOS-1)
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801  Multisatellite data processing p. 39—A87-37803  Physical principles of image convergence in remote sensing p. 40—A87-41925  Optical image subtraction techniques, 1975-1985 p. 40—A87-42659  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p. 16—N87-22286  The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290  The integration of spectral and spatial analysis for land use classification  [AD-A178703] p. 14—N87-23015  An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity  [DE87-006059] p. 41—N87-24011  Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries  [NASA-CR-180984] p. 33—N87-24012  Earth science research  [NASA-CR-180512] p. 11—N87-24733  Optical Transfer Function (OTF)-based quality criteria for aenal cameras and imaging systems	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  IISSN-0469-4236   p 16 N87-22286	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective reating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification  JAPAN  Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p. 20 A87-32497  JAPANESE SPACECRAFT  Marine Observation Satellite-1 (MOS-1)  p. 20 A87-32499
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97.  [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An almospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries [NASA-CR-180984] p. 33—N87-24012 Earth science research [NASA-CR-180981] p. 11—N87-24733 Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems p. 51—N87-24742 Towards an automatic identification of urban textures p. 14—N87-24747	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286 Cuick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4  [NASA-CR-181073] p 43 N87-24817  INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280  INFRARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012  INFRARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2 0 microns) p 48 A87-41588  INFRARED IMAGERY Remote sensing as a research tool sea ice surveillance from aircraft and spacecraft p 28 A87-40648 An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628 Definition of a thermal infrared pushbroom imager for Earth observation p 53 N87-24765  INFRARED PHOTOGRAPHY	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification p. 37 A87-35313  JAPAN  Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p. 20 A87-32497  JAPANESE SPACECRAFT  Marine Observation Satellite-1 (MOS-1)  p. 20 A87-32499  Airborne observation experiments for MOS-1 verification
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801  Multisatellite data processing p. 39—A87-37803  Physical principles of image convergence in remote sensing p. 40—A87-41925  Optical image subtraction techniques, 1975-1985 p. 40—A87-42659  Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p. 16—N87-22286  The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290  The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015  An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-066059] p. 41—N87-24011  Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries [NASA-CR-180984] p. 33—N87-24012  Earth science research [NASA-CR-180984] p. 33—N87-2473  Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems p. 51—N87-24742  Towards an automatic identification of urban textures p. 14—N87-24747  A modular and versatile acquisition, recording and	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808 INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97 [ISSN-0469-4236] p 16 N87-22286 Quick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4 [NASA-CR-181073] p 43 N87-24817 INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280 INFARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012 INFRARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2 0 microns) p 48 A87-41588 INFRARED IMAGERY Remote sensing as a research tool sea ice surveillance from aircraft and spacecraft p 28 A87-40648 An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628 Definition of a thermal infrared pushbroom imager for Earth observation INFARED PHOTOGRAPHY A comparison of optical bar, high-allitude, and	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry (AD-A175754) p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32990  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification  Japan  Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p. 20 A87-32497  JAPANESE SPACECRAFT  Marine Observation Satellite-1 (MOS-1)  p. 20 A87-32499  Airborne observation experiments for MOS-1 verification program (MVP)
Image preprocessing for line detection based on local structure analysis p. 39—A87-37801 Multisatellite data processing p. 39—A87-37803 Physical principles of image convergence in remote sensing p. 40—A87-41925 Optical image subtraction techniques, 1975-1985 p. 40—A87-42659 Reports on cartography and geodesy, series 1, number 97.  [ISSN-0469-4236] p. 16—N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p. 16—N87-22290 The integration of spectral and spatial analysis for land use classification [AD-A178703] p. 14—N87-23015 An almospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity [DE87-006059] p. 41—N87-24011 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries [NASA-CR-180984] p. 33—N87-24012 Earth science research [NASA-CR-180981] p. 11—N87-24733 Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems p. 51—N87-24742 Towards an automatic identification of urban textures p. 14—N87-24747	A review p 52 N87-24749 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808  INFORMATION SYSTEMS Reports on cartography and geodesy, series 1, number 97  [ISSN-0469-4236] p 16 N87-22286 Cuick-look guide to the crustal dynamics project's data information system [NASA-TM-87818] p 16 N87-23018 Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year 4  [NASA-CR-181073] p 43 N87-24817  INFORMATION THEORY A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280  INFRARED DETECTORS Atmospheric remote sensing in arctic regions [AD-A179550] p 50 N87-23012  INFRARED FILTERS Ground and aerial use of an infrared video camera with a mid-infrared filter (1 45 to 2 0 microns) p 48 A87-41588  INFRARED IMAGERY Remote sensing as a research tool sea ice surveillance from aircraft and spacecraft p 28 A87-40648 An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628 Definition of a thermal infrared pushbroom imager for Earth observation p 53 N87-24765  INFRARED PHOTOGRAPHY	Remote Ocean Sensing System) radar scatterometer data in a simplified geometry [AD-A175754] p. 49 N87-20642  INTERTROPICAL CONVERGENT ZONES  Convective neating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p. 21 A87-32982  OH measurement near the intertropical convergence zone in the Pacific p. 21 A87-33430  IRRADIANCE  Computation of diffuse sky irradiance from multidirectional radiance measurements  p. 6 A87-37279  IRRIGATION  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p. 2 A87-32090  ITERATIVE SOLUTION  Introduction of initial centers for the algorithm of clustering around mobile centers in multispectral image classification p. 37 A87-35313  JAPAN  Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p. 20 A87-32497  JAPANESE SPACECRAFT  Marine Observation Satellite-1 (MOS-1)  p. 20 A87-32499  Airborne observation experiments for MOS-1 verification

K

### KENYA

Detection of Rift Valley fever viral activity in Kenya by p 7 A87-37827 satellite remote sensing imagery

## LAGEOS (SATELLITE)

Earth rotation, station coordinates and determination from satellite laser ranging p 43 A87-32349

The determination of earth-rotation parameters from satellite laser ranging p 15 A87-34186

## LAKES

Spatial characterization of acid rain stress in Canadian Shield lakes [NASA-CR-180983] p 36 N87-24031

Soatial characterization of acid rain stress in Canadian

INASA-CR-1809821 p 36 N87-24032

# LAND ICE

West Antarctic ice streams draining into the Ross Ice Shelf Configuration and mass balance

p 19 A87-31592 Satellite techniques for studying ice crusts and underground waters in the eastern Pamir

p 35 A87-36106

p 43 N87-24814

## LAND USE

Remote sensing research in global agricultural A87-32008 productivity p 2 Calibration of satellite radiometers and the comparisor of vegetation indices p 2 A87-32091 Polarization, land use type and intraurban location as variables in SAR mapping accuracy p 12 A87-32953 p 45 A87-33122 Applied remote sensing --- Book comparison of optical bar, high-altitude, and black-and-white photography in land classification

n 4 A87-35122 Comparison of Landsat MSS and TM data for urban land-use classification p 13 A87-35523 An assessment of Landsat MSS and TM data for urban and near-urban land-cover digital classification

p 13 A87-37280 Remote sensing of vegetation change near Inco's p 8 A87-39185 Sudbury mining complexes Urban land use separability as a function of radar p 14 A87-39188 polarization Comparative analysis of Thematic Mapper and SPOT image data for land use investigation p 51 N87-24746 Large format camera image analysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, p 55 N87-24789 North Italy Image quality problems in practical aerial photography

# LANDFORMS

Landform investigation utilizing digitally processed atellite Thematic Mapper imagery p 38 A87-36546 LANDSAT SATELLITES

Habitat mapping by Landsat for aerial census of kangaroos p 2 A87-32094 Continental land cover assessment using Landsat MSS p 3 A87-32095 data Landsat classification of Argentina summer crops

n 3 A87-32098 Correction for atmospheric and topographic effects on the Landsat MSS data p 37 A87-32489 Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493 Landcover change in Hiroshima during 1979/1984 p 12 A87-32493 detected by Landsat MSS and TM data

p 12 A87-32494 Fundamental study on systematization of selecting new development area with Landsat data and topographic informations p 12 A87-32496 United States remote sensing satellites (RSSs) past, present, and future p 56 French spot and the U.S. Landsat jockey for position in the race for a multimillion-dollar remote sensing market --- commercial prospects for Landsat and Spot imagery p 56 A87-34600

Identifying vegetable crops with Landsat Thematic Mapper data p 4 A87-35120 The topographic effect on Landsat data in cently

undulating terrain in southern Sweden p 4 A87-35307 Landsat image enhancement study of possible submerged sand-dunes in the Arabian Gulf p 22 A87-35315

Comparison of Landsat MSS and TM data for urban land-use classification p 13 A87-35523 Fault patterns by space remote sensing and the rotation of western Oregon during Cenozoic times

p 18 A87-36525

Reconnaissance of vegetal formations in a Guinean forest sector by means of Landsat images

p 6 A87-36946 Testing the consistency for mapping urban vegetation with high-altitude aerial photographs and Landsat MSS data p 13 A87-37277

An assessment of Landsat MSS and TM data for urban and near-urban land-cover digital classification

p 13 A87-37280 Landsat as an aid in evaluating the adequacy of a grain p 7 A87-37282 silo network p 38 A87-37288 The Denali image map

Data Compression System for video images

p 46 A87-37421 p 39 A87-37803 Multisatellite data processing Remote sensing of coastal wetlands

D 9 A87-40944 A soil map through Landsat satellite imagery in a part

of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India o 9 A87-41428 Comparative evaluation and guide for the integrated utilization of LANDSAT (MSS and TM) and SPOT (HRV) satellites remotely sensed data

p 41 N87-22278 Enhanced LANDSAT images of Antarctica and planeta p 50 N87-23558 exploration

Geochronological studies of strandlines of Saurashtra India, detected by remote sensing techniques

p 15 A87-35308

# LANDSAT 4

Landform investigation utilizing digitally processed satellite Thematic Mapper imagery p 38 A87-36546 Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsal p 35 A87-39467

## LANDSAT 5

Spectral classification of Landsat-5 Thematic Mapper p 37 A87-32488 High resolution remote sensing of spatially and spectrally

complex coal surface mines of central Pennsylvania - A comparison between simulated SPOT MSS and Landsat-5 thematic mapper p 18 A87-39468 Radiometric comparison of the Landsat-5 TM and MSS p 47 A87-41432

Towards an automatic identification of urban textures p 14 N87-24747

## LASER ALTIMETERS

Two-color short-pulse laser altimeter measurements of ocean surface backscatter p 27 A87-39462 Laser reflectance as a function of rough water glitter profile AD-A1787741

p 32 N87-23016 Applications of laser airborne telemetry at Institut Geographique National (IGN), France p 53 N87-24761

# LASER APPLICATIONS

Potential of laser remote sensing of oil below water surface IFOA-C-30435-3.11 p 30 N87-20659 Applications of laser airborne telemetry at Institut Geographique National (IGN), France

p 53 N87-24761

# LASER INDUCED FLUORESCENCE

Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432

Potential of laser remote sensing of oil below water surface [FOA-C-30435-3.1] p 30 N87-20659

# LASER OUTPUTS

Laser reflectance as a function of rough water glitter profile . [AD-A178774] p 32 N87-23016

# LASER RANGE FINDERS

Earth rotation, station coordinates and orbit determination from satellite laser ranging p 43 A87-32349

Investigation of tectonic deformations using global satellite laser ranging data p 14 A87-33375 The determination of earth-rotation parameters from satellite laser ranging p 15 A87-34186 International Conference on Earth Rotation and the Terrestrial Reference Frame, Columbus, OH, July 31-Aug.

2, 1985, Proceedings. Volumes 1 & 2 p 15 A87-36126 GINFEST - Geodetic intercomparison network for evaluating space techniques p 15 A87-36164 Report on the Special Program 78 satellite geodesy of

the Technical University of Munich [ASTRON-GEODAET-ARB-48] p 16 N87-20618 Reports on cartography and geodesy, series 1, number

USSN-0469-42361 p 16 N87-22282

Applications of laser airborne telemetry at institut Geographique National (IGN), France

### LASER SPECTROMETERS

Atmospheric environment monitoring system based on an earth-to-satellite Hadamard transform laser long-path absorption spectrometer - A proposal

p 45 A87-35502

p 29 A87-42640

Mid-infrared remote sensing systems and their p 17 A87-35522 application to lithologic mapping LATERITES

First results of lateritic cover mapping with SPOT images The Kangaba region (South-Mali) p 18 A87-36925

## LEAVES

Variations in the polarized leaf reflectance of Sorghum p 7 A87-38097 picolor

Error analysis of leaf area estimates made from allometric regression models

NASA-TM-892201 p 11 N87-24010 New dimension analyses with error analysis for quaking aspen and black spruce

(NASA-TM-89219) p 11 N87-24735 inversion of canopy reflectance models for estimation

of vegetation parameters [NASA-CR-181059] p 12 N87-24737

LENSES

On the matching of resolution in aerial photographic systems

## LIGHT SCATTERING

Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on p 12 A87-32493 light scattering The interaction of light with phytoplankton in the marine

### environment LIGHT SOURCES

Optical image subtraction techniques, 1975-1985 p 40 A87-42659

# LIMESTONE

Geochronological studies of strandlines of Saurashtra. India, detected by remote sensing techniques

p 15 A87-35308

## LINEAR POLARIZATION

Polarized views of the earth from orbital altitude p 48 A87-42639

LINEAR PROGRAMMING

Optimization of a program of experiments in connection with the operational planning of studies carried out with p 56 A87-34208 a spacecraft

# LITHOLOGY

Mid-infrared remote sensing systems and their application to lithologic mapping p 17 A87-35522 LITHOSPHERE

p 45 A87-33122 Applied remote sensing --- Book LOUISIANA Utilizing remote sensing of thematic mapper data to

improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent INASA-CR-1809841 p 33 N87-24012

LOW GRAVITY MANUFACTURING

Arianespace top performance benefits ESA

p 57 N87-24493

# MAGNETIC AMPLIFIERS

The effect of receiver amplifier non-linearity on ERS-1 synthetic aperture radar imagery p 52 N87-24755 p 52 N87-24755 MAGNETIC ANOMALIES

Exploration of geomagnetic field anomaly with balloon p 17 A87-32478 for geophysical research

# MAGNETIC MEASUREMENT

Exploration of geomagnetic field anomaly with balloon or geophysical research p 17 A87-32478 for geophysical research MANUALS

Comparative evaluation and guide for the integrated utilization of LANDSAT (MSS and TM) and SPOT (HRV) satellites remotely sensed data

### p 41 N87-22278 [ETN-87-99356] MAPPING

Mid-infrared remote sensing systems and their pplication to lithologic mapping p 17 A87-35522 application to lithologic mapping First results of lateritic cover mapping with SPOT images The Kangaba region (South-Mali) p 18 A87-36925 Testing the consistency for mapping urban vegetation with high-altitude aerial photographs and Landsat MSS p 13 A87-37277 data

Quick look Atlantic Ocean rain maps for gale [NASA-CR-180511] p 30 N87-21533 Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during p 31 N87-21980

Reports on cartography and geodesy, series 1, number

Arctic Sea ice. 1973-1976. Satellite passive-microwave

MICROWAVE TRANSMISSION

Analysis of moderate and intense rainfall rates observations p 16 N87-22282 p 33 N87-24870 HSSN-0469-42361 INASA-SP-4891 continuously recorded over half a century and influence Altimeter measurements for the determination of the METEOROLOGICAL RADAR on microwave communications planning and rain-rate data arth's gravity field p 46 A87-36933 VHF radar for ocean surface current and sea state p 17 N87-23033 LNASA-CR-1805201 MICROWAVES remote sensing p 19 A87-31631 MARINE ENVIRONMENTS Observation of precipitation from space by the weather Quantifying spatial and temporal variabilities of icrowave brightness temperature over the U.S. Southern Measurements of nitric oxide in the boundary layer and p 44 A87-32507 p 5 A87-35309 free troposphere over the Pacific Ocean Great Plains METEOROLOGICAL SATELLITES MIDLATITUDE ATMOSPHERE p 21 A87-33431 Impact of satellite-based data on FGGE general inculation statistics p 44 A87-32985 Preliminary report on the development of marine Determining rainfall intensity and type from GOES circulation statistics geographic information systems Remote-sensing method for determining monthly imagery in the midlatitudes p 34 A87-32092 n 23 A87-37056 The interaction of light with phytoplankton in the marine On the relative accuracy of satellite and raingage rainfall precipitation sums using Meteor-satellite data on the p 29 A87-42640 measurements over middle latitudes during daylight Atlantic Ocean p 21 A87-34447 p 34 A87-33295 CHART A computer plotting package for the display AVHRR data services in Europe The Earthnet hours of position-dependent marine data MILLET approach o 39 A87-37922 PB87-148607] p 31 N87-22297 A crop condition and crop yield estimation method based Satellite estimation of a solar irradiance at the surface on NOAA/AVHRR satellite data p 10 N87-22280 High resolution sea surface temperature field derived of the earth and of surface albedo using a physical model MILLIMETER WAVES p 33 N87-24731 applied to Meteosat data D 47 A87-40246 MARINE METEOROLOGY The relation of millimeter-wavelength backscatter to Atmospheric remote sensing in arctic regions p 50 N87-23012 Convective heating and precipitation estimates for the [AD-A179550] surface snow properties p 34 A87-35518 tropical South Pacific during FGGE, 10-18 January 1979 Arianespace top performance benefits ESA MINERAL DEPOSITS p 21 A87-32982 First results of lateritic cover mapping with SPOT images p 57 The Kangaba region (South-Mail) The present status of operational wave forecasting ---METEOROLOGICAL SERVICES p 18 A87-36925 Predicting the location of kimberlite from a probability for ocean surface p 24 A87-38831 The application of remote sensing in agricultural Optical properties of the marine atmospheric boundary analysis of linear structure on remote sensing data meteorology at the Meteorological Service of the HPR p 28 A87-42638 p 2 A87-32010 p 18 A87-39186 laver - Aerosol profiles MARINE TECHNOLOGY MINERAL EXPLORATION METEOSAT SATELLITE Optical dynamics experiment (ODEX) data report R/V A curious sea-surface-temperature Mid-infrared remote sensing systems and their phenomenor acania expedition 10 October-17 November 1982. Volume p 19 A87-31572 application to lithologic mapping observed by Meteosat p 17 A87-35522 Particle size distributions. Volume 6: Scalar p 39 A87-37803 Multisatellite data processing spectral-radiometer data High resolution remote sensing of spatially and spectrally [AD-A178535] p 32 N87-23104 complex coal surface mines of central Pennsylvania - A The possibility of using satellite measurements of comparison between simulated SPOT MSS and Landsat-5 MARITIME SATELLITES methane in the atmosphere to study the global-distribution thematic mapper p 18 A87-39468 Marine Observation Satellite-1 (MOS-1) p 13 A87-36125 haracteristics of its sources p 20 A87-32499 **METRIC PHOTOGRAPHY** Airborne observation experiments for MOS-1 verification Geometrical system calibration, especially for metric Remote sensing of vegetation change near Inco's p 44 A87-32500 p 51 N87-24745 Sudbury mining complexes MINNESOTA p8 A87-39185 program (MVP) MARKETING Large Format Camera photographs of the Black Hills, French spot and the U.S. Landsat jockey for position USA, and their suitability for topographic and thematic Earth science research INASA-CR-1805121 in the race for a multimillion-dollar remote sensing market p 55 N87-24792 n 11 N87-24733 --- commercial prospects for Landsat and Spot imagery Ten year change in forest succession and composition MICROWAVE EMISSION p 56 A87-34600 easured by remote sensing The dependence of sea-surface microwave emission on MARS SURFACE wind speed, frequency, incidence angle, and polarization INASA-CR-1809481 p 11 N87-24736 Enhanced LANDSAT images of Antarctica and planetary MISSION PLANNING over the frequency range from 1 to 40 GHz p 22 A87-35515 Airborne observation experiments for MOS-1 verification exploration p 50 N87-23558 ogram (MVP) p 44 A87-32500 Scientific goals and technical limitations of the MARSHLANDS Salinity effects on the microwave emission of soils program (MVP) p 5 A87-35520 Utilizing remote sensing of thematic mapper data to shuttleborne synthetic aperture experiment X-SAR improve our understanding of estuarine processes and MICROWAVE EQUIPMENT p 44 A87-32505 their influence on the productivity of estuarine-dependent Atmospheric remote sensing in arctic regions 1AD-A1795501 p 50 N87-23012 fisheries INASA-CR-1809841 p 33 N87-24012 MICROWAVE IMAGERY Studies of the east Australian current off northern New Remote sensing as a research tool --- sea ice South Wales MASS FLOW p 32 N87-23103 West Antarctic ice streams draining into the Ross Ice surveillance from aircraft and spacecraft MODULATION TRANSFER FUNCTION p 28 A87-40648 Shelf Configuration and mass balance MICROWAVE RADIOMETERS Improvement of image quality by forward motion p 19 A87-31592 compensation, a preliminary report p 42 N87-24741 MATHEMATICAL MODELS Nimbus 7 SMMR investigation of snowpack properties Optical Transfer Function (OTF)-based quality criteria in the northern Great Plains for the winter of 1978-1979 A new covariance model for inertial gravimetry and p 34 A87-31409 for aerial cameras and imaging systems p 14 A87-31591 gradiometry p 51 N87-24742 Applications of satellite microwave radiometry in A soil thermal model for remote sensing p 44 A87-32952 MONSOONS p 5 A87-35521 Monsoon flood boundary delineation and damage Seasonal and regional variations of active/passive Stochastic nature of Landsat MSS data assessment using space borne imaging radar and Landsat microwave signatures of sea ice p 22 A87-35516 p 46 A87-38093 p 35 A87-39467 Microwave sea-ice signatures near the onset of me Surface models including direct cross-radiation p 22 A87-35517 MOUNTAINS p 40 A87-39189 simple model of furrowed surfaces Montane vegetation stratification through digital Salinity effects on the microwave emission of soils An atmospheric correction algorithm for remote processing of Landsat MSS data p.9 A87-40302 p 5 A87-35520 identification of non-Lambertian surfaces and its range of Radar as a complement to topographic maps for Recurring polynyas over the Cosmonaut Sea and the delineating marine terraces p 23 A87-37563 Maud Rise p 41 N87-24011 LDE87-0060591 IPRR7-1545971 p 41 N87-24013 Monitoring vegetation using Nimbus-7 **MULTISENSOR APPLICATIONS** Inversion of canopy reflectance models for estimation mutichannel microwave radiometer's data Merging multiresolution SPOT HRV and Landsat TM p8 A87-39194 of vegetation parameters data p 38 A87-37287 [NASA-CR-181059] p 12 N87-24737 Remotely sensed sea surface temperature for the Alpine MULTISPECTRAL BAND CAMERAS Radial orbit error reduction and sea surface topography Experiment (ALPEX) --- AVHRR-2 data D 30 N87-21497 The production of photographs of the Earth's surface determination using satellite altimetry MICROWAVE SENSORS taken from satellites and their application in map production INASA-CR-1805701 p 33 N87-24816 p 55 N87-24788 Temporal observations of surface soil moisture using and map revision **MAXIMUM LIKELIHOOD ESTIMATES** p 7 A87-38094 a passive microwave sensor Determination of spectral reflectance of crops during A comparison of supervised maximum likelihood and Nadir looking airborne radar and possible application decision tree classification for crop cover estimation from growth from calibrated multispectral small format aerial p 7 A87-38095 to forestry p 12 N87-24801 photography multitemporal Landsat MSS data p 5 A87-35312 MICROWAVE SOUNDING **MULTISPECTRAL BAND SCANNERS** Landsat as an aid in evaluating the adequacy of a grain Airborne microwave Doppler measurements of ocean silo r...:work Continental land cover assessment using Landsat MSS p 26 A87-39180 wave directional spectra p 3 A87-32095 **MEASURING INSTRUMENTS** MICROWAVE SPECTRA Correction for atmospheric and topographic effects on Reports on cartography and geodesy, series 1, number The microwave measurement of ocean-wave directional the Landsat MSS data p 37 A87-32489 spectra p 24 A87-38836 [ISSN-0469-4236] p 16 N87-22282 Estimation of roughness of the earth's surface using Procedures for the description of agricultural crops and MELTING Landsat MSS data on the assumption of reciprocity on soils in optical and microwave remote sensing studies Microwave sea-ice signatures near the onset of melt light scattering p 12 A87-32493 p 8 A87-39187 p 22 A87-35517 toover change in Hiroshima during 1979/1984 **MICROWAVE SPECTROMETERS** / Landsat MSS and TM data **MESOSCALE PHENOMENA** The physical basis for estimating wave-energy spectra p 12 A87-32494 Mesoscale oceanographic processes beneath the ice with the radar ocean-wave spectrometer p 28 A87-40434 ssion intersection method of adjusting image of Fram Strait p 25 A87-38839 Advanced imaging spectrometer for ocean and further **METEOROLOGICAL PARAMETERS** and ratioing p 45 A87-35306 Energy Balance of the Tropical Systems (BEST): A space color/fluorescence the religionment of a satellite remote sensing technique rithe study of alpine glaciers p 34 A87-35311 measurements

p 33 N87-24766

for the study of alpine glaciers

experiment proposition

p 36 N87-22373

applications

SUBJECT INDEX A companson of supervised maximum likelihood and decision tree classification for crop cover estimation from multitemporal Landsat MSS data p 5 A87-35312 Landsat image enhancement study of possible submerged sand-dunes in the Arabian Gulf p 22 A87-35315 Combining panchromatic and multispectral imagery from dual resolution satellite instruments p 38 A87-37276 Testing the consistency for mapping urban vegetation with high-altitude aerial photographs and Landsat MSS p 13 A87-37277 data An assessment of Landsat MSS and TM data for urban and near-urban land-cover digital classification p 13 A87-37280 Stochastic nature of Landsat MSS data p 46 A87-38093 Synergistic use of MOMS-01 and Landsat TM data ... Modular Optoelectronic Multispectral Scanner p 46 A87-39190 Radiometric comparison of the Landsat-5 TM and MSS p 47 A87-41432 sensors Inland wetland change detection using aircraft MSS p 36 A87-42256 Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies Test site: Pantanal Region (Brazil/Paraguay) p 52 N87-24748 The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager: Four years of operation p 53 N87-24767 The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuer Forschung und Technologie (BMFT). Milestones in the development of an operational Earth Observation p 55 N87-24815 system **MULTISPECTRAL PHOTOGRAPHY** An application of low attitude multispectral photography to agricultural field trials p 6 A87-37054 Foundations and applications of multispectral scanning INLR-MP-85015-UI p 10 N87-21408 Enhanced LANDSAT images of Antarctica and planetary p 50 N87-23558 exploration N Deriving surface albedo measurements from narro

NARROWBAND NASA PROGRAMS Evaluation NATIONAL PARKS NAVIGATION IPB87-1486071 and terrain derivation A review **NEARSHORE WATER** 

p 13 A87-39182 band satellite data Operational overview of NASA GTE/CITE 1 airborne

instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation --- Global Tropospheric Experiment/Chemical Instrumentation p 45 A87-33426

The Denali image map p 38 A87-37288

CHART: A computer plotting package for the display of position-dependent marine data p 31 N87-22297

**NAVIGATION AIDS** Application of Global Positioning System (GPS) receivers for Earth observation p 53 N87-24763 Investigation of simulated Monocular Electro-Optical Stereo Scanner (MEOSS)-imagery for sensor navigation p 54 N87-24771

NAVIGATION INSTRUMENTS The use of camera orientation data in photogrammetry: review p 52 N87-24749

Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to Salyut-6 p 35 A87-36103 photographs NIGERIA

Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954

NIMBUS 7 SATELLITE

Nimbus 7 SMMR investigation of snowpack properties in the northern Great Plains for the winter of 1978-1979 p 34 A87-31409

Reflectivity of earth's surface and clouds in ultraviolet p 47 A87-40768 from satellite observations

NITRIC OXIDE

NITROGEN

Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431 Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432

Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 NOAA SATELLITES

Global vegetation monitoring using NOAA vegetation p 3 A8 32495 index data Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p 20 A87-32497 Relation between precipitation and brightness of earth surface in the NOAA/GVIP data p 3 A87-32498 A crop condition and crop yield estimation method based p 10 N87-22280 on NOAA/AVHRR satellite data NONLINEARITY

The effect of receiver amplifier non-linearity on ERS-1 p 52 N87-24755 synthetic aperture radar imagery **NORTH AMERICA** 

Comparison of North and South American biomes from AVHRR observations p 9 A87-40303 NORWAY

An evaluation of the polar ice prediction system p 41 N87-23014 IAD-A1785221

NUMERICAL ANALYSIS

High resolution sea surface temperature field derived p 33 N87-24731

NUMERICAL WEATHER FORECASTING

The present status of operational wave forecasting p 24 A87-38831 for ocean surface The operational performance of the fleet numerical oceanography center global spectral ocean-wave model p 24 A87-38832 Recent results with a third-generation ocean-wave

odel p 24 A87-38833 The impact of initial conditions and SST Anomalies on model

extended range predictions for the El Nino period --- sea p 32 N87-23046 surface temperature (SST)

# 0

### OCEAN BOTTOM

Feedback between ice flow, barotropic flow, and baroclinic flow in the presence of bottom topography p 27 A87-40289

Tidal estimation in the Atlantic and Indian Oceans, 3 dea x 3 dea solution [NASA-TM-87812]

OCEAN COLOR SCANNER

The relationship between phytoplankton concentration and light attenuation in ocean waters p 29 A87-42642 Advanced imaging spectrometer for ocean olor/fluorescence measurements and further color/fluorescence p 33 N87-24766

OCEAN CURRENTS

VHF radar for ocean surface current and sea state p 19 A87-31631 remote sensing Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87-35314

Tidal estimation in the Atlantic and Indian Oceans, 3 deg x 3 deg solution (NASA-TM-87812) p.30 N87-21534

DUCK '85 nearshore waves and currents experiment data summary report [AD-A177419] p 31 N87-22382 Studies of the an current off northern New

South Wales IAD-A1784611 p 32 N87-23103 OCEAN DATA ACC SYSTEMS

A Spectrasat sy: sign based on the Geosat p 26 A87-38848 experiment Ocean-ice panel report --- International Space Station p 30 N87-20635

Simulation of wind gradient errors in NROSS (Navy Remote Ocean Sensing System) radar scatterometer data in a simplified geometry

(AD-A175754) p 49 N87-20642 Report of the workshop on Assimilation of Satellite Wind and Wave Data in Numerical Weather and Wave Prediction

IWCP-1221 p 49 N87-21521 Advanced imaging spectrometer for ocean plor/fluorescence measurements and further color/fluorescence p 33 N87-24766 applications The first ESA remote sensing satellite (status and outlook) p 57 N87-24777

**OCEAN DYNAMICS** 

Use of satellite altimetry for ocean monitoring

p 23 A87-36101 The age and source of ocean swell observed in Hurricane Josephine o 25 A87-38843 Spectrasat - A hybrid ROWS/SAR approach to monitor ocean waves from space p 25 A87-38845

The Geosat altimeter mission - A milestone in satellite p 27 A87-40281 Feedback between ice flow, barotropic flow, and

baroclinic flow in the presence of bottom topography p 27 A87-40289

Mesoscale oceanographic processes beneath the ice p 28 A87-40434 OCEAN MODELS

The present status of operational wave forecasting for ocean surface p 24 A87-38831

The operational performance of the fleet numerical oceanography center global spectral ocean-wave model p 24 A87-38832

Recent results with a third-generation ocean-wave p 24 A87-38833

A practical methodology for estimating wave spectra from the SIR-B p 25 A87-38841 from the SIR-B The age and source of ocean swell observed in Hurricane Josephine p 25 A87-38843

The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface p 26 A87-39179

Ocean wind and wave model comparisons with GEOSAT (GEOdesy SATellite) satellite data £33 N87-24061 JAD-A1783021

**OCEAN SURFACE** 

Biharmonic spline interpolation of GEOS-3 and Seasat p 20 A87-32770 altımeter data

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz p 22 A87-35515

Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salvut-6' photographs p 35 A87-36103 Measurement of the spatial spectrum of ocean waves

using a two-frequency scatterometer p 23 A87-36107 Some approaches for comparing remote and in-situ estimates of directional wave spectra p 24 A87-38835

The microwave measurement of ocean-wave directional spectra p 24 A87-38836 The physical basis for estimating wave-energy spectra

with the radar ocean-wave spectrometer p 25 A87-38839

Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar

p 25 A87-38840 The Radar Ocean-Wave Spectrometer

p 25 A87-38846 A Spectrasat system design based on the Geosat p 26 A87-38848

The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface p 26 A87-39179

Airborne microwave Doppler measurements of ocean wave directional spectra p 26 A87-39180 Two-color short-pulse laser altimeter measurements of ocean surface backscatter p 27 A87-39462

The propagation of short surface waves on longer gravity p 28 A87-40835 Multilook images of ocean waves by synthetic aperture p 28 A87-41068 radars

Wind and nadir angle effects on airborne lidar water 'surface' returns D 29 A87-42641 A technique to estimate the ocean surface energy flux p 30 N87-20710 using VAS multispectral data

Laser reflectance as a function of rough water glitter profile [AD-A178774] p 32 N87-23016 Altimeter measurements for the determination of the

Earth's gravity field INASA-CR-1805201 p 17 N87-23033 The SIR-B mission. Towards an understanding of internal

vaves in the ocean IARE-TR-861221 p 32 N87-23102 Ocean wind and wave model comparisons with GEOSAT

(GEOdesy SATellite) satellite data p 33 N87-24061 [AD-A178302] Radial orbit error reduction and sea surface topography

determination using satellite altimetry p 33 N87-24816 INASA-CR-1805701

OCEANOGRAPHIC PARAMETERS

Optical dynamics experiment (ODEX) data report R/V acania expedition 10 October-17 November 1982. Volume Particle size distributions. Volume 6: Scalar spectral-radiometer data

[AD-A178535] p 32 N87-23104 Arctic Sea ice, 1973-1976: Satellite passive-microwave

p 33 N87-24870 INASA-SP-4891

**OCEANOGRAPHY** Marine Observation Satellite-1 (MOS-1)

n 20 A87-32499

The French Space Oceanography Program

p 20 A87-32503 Measuring ocean waves from space, Proceedings of the Symposium, Johns Hopkins University, Laurel, MD, Apr.

5-17, 1986 p 24 A87-38826 Remote sensing as a research tool --- sea ice 15-17, 1986 surveillance from aircraft and spacecraft

p 28 A87-40648

p 29 A87-42643

p 29 A87-42645

Remote sensing of chlorophyll concentrations in the

Coastal zone color scanner imagery of phytoplankton

Sunlight induced 685 nm fluorescence imagery p 30 A87-42646

northern Gulf of Mexico

pigment distribution in Icelandic waters

Ocean optics VIII; Proceedings of the Meeting, Orlando.	ORBITAL SPACE STATIONS	Spacelab data - A new contribution for structural
FL, Mar. 31-Apr 2, 1986	Proceedings of the European Symposium on Polar	interpretations of remotely sensed data in geology
[SPIE-637] p 28 A87-42637	platform Opportunities and Instrumentation for	p 18 A87-39790
A model for the use of satellite remote sensing for the	Remote-Sensing (ESPOIR)	PHOTOGRAMMETRY
measurement of primary production in the ocean	(ESA-SP-266) p 48 N87-20621	Aerotriangulation without ground control
p 29 A87-42644	The Earth observation activities of the European Space	p 46 A87-37289 Measurements on digitized hardcopy images
Continental shelf processes affecting the oceanography	Agency and the use of the polar platform of the International Space Station p 49 N87-20622	p 39 A87-37290
of the South Atlantic Bight [DE87-005303] p 30 N87-20716	European utilization aspects studies space stations	Proceedings of the International Symposium on Progress
Report of the workshop on Assimilation of Satellite Wind	p 49 N87-20624	in Imaging Sensors
and Wave Data in Numerical Weather and Wave Prediction	Land panel report International Space Station	[ESA-SP-252] p 50 N87-24738
Models	p 49 N87-20634	The use of camera orientation data in photogrammetry.
[WCP-122] p 49 N87-21521	Ocean-ice panel report International Space Station	A review p 52 N87-24749
An evaluation of the polar ice prediction system	p 30 N87-20635	Applications of laser airborne telemetry at Institut
[AD-A178522] p 41 N87-23014	OROGRAPHY	Geographique National (IGN), France
The SIR-B mission: Towards an understanding of internal	The Denali image map p 38 A87-37288	p 53 N87-24761
waves in the ocean	ORTHOPHOTOGRAPHY	The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy
[ARE-TR-86122] p 32 N87-23102	Introduction of geometric information to radar image	p 53 N87-24768
OHIO	data p 42 N87-24754	Aerial triangulation of CCD line-scanner images
An evaluation of satellite-based insolation estimates for	OZONE	p 54 N87-24769
Ohio p 34 A87-33297	Trace gas exchanges and transports over the	The role of government specifications in aerial
OIL POLLUTION	Amazonian rain forest p 12 A87-32196	photography p 57 N87-24780
Potential of laser remote sensing of oil below water	OZONOMETRY	Digital data acquisition for close-range
surface	Reflectivity of earth's surface and clouds in ultraviolet	photogrammetry p 54 N87-24785
[FOA-C-30435-3.1] p 30 N87-20659	from satellite observations p 47 A87-40768	Estimating photogrammetric precision and cartographic
ONBOARD DATA PROCESSING		potential of space imagery p 42 N87-24791
A modular and versatile acquisition, recording and	P	The use of auxiliary date in photogrammetric adjustments p 42 N87-24808
preprocessing system for airborne remote sensing p 52 N87-24751	<b>F</b>	PHOTOGRAPHIC FILM
	PACIFIC OCEAN	On the matching of resolution in aerial photographic
OPTICAL DATA PROCESSING	Free tropospheric and boundary layer measurements	systems p 54 N87-24773
Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr.2, 1986	of NO over the central and eastern North Pacific Ocean	Exposure test with high resolution films from high
SPIE-637   p 28 A87-42637	p 21 A87-33432	altitude p 54 N87-24775
Optical image subtraction techniques, 1975-1985	Carbon monoxide measurements over the eastern	Very high resolution aerial films p 54 N87-24776
p 40 A87-42659	Pacific during GTE/CITE 1 Chemical Instrumentation	The RMK aenal camera system: Performance potential
Optical and digital SAR processing techniques: A	Test and Evaluation p 21 A87-33435	of aerial photography with forward motion compensation
statistical comparison of accuracy using SEASAT	PARAMETER IDENTIFICATION	p 54 N87-24781
magery p 42 N87-24753	Inversion of canopy reflectance models for estimation	PHOTOGRAPHIC MEASUREMENT
OPTICAL DENSITY	of vegetation parameters	A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491
Spectrophotometric measurements on color aerial	[NASA-CR-181059] p 12 N87-24737	Large Format Camera p 43 A87-32491 PHOTOINTERPRETATION
photographs p 55 N87-24798	PARTICLE SIZE DISTRIBUTION Optical dynamics experiment (ODEX) data report R/V	Image preprocessing for line detection based on local
OPTICAL EQUIPMENT	acania expedition 10 October-17 November 1982. Volume	structure analysis p 39 A87-37801
Ocean optics VIII; Proceedings of the Meeting, Orlando,	2: Particle size distributions. Volume 6: Scalar	Spacelab data - A new contribution for structural
FL, Mar. 31-Apr.2, 1986	spectral-radiometer data	interpretations of remotely sensed data in geology
[SPIE-637] p 28 A87-42637	[AD-A178535] p 32 N87-23104	p 18 A87-39790
OPTICAL POLARIZATION	PAYLOAD INTEGRATION	Comparison between digital and manual interpretation
Variations in the polarized leaf reflectance of Sorghum	Optimization of a program of experiments in connection	of high altitude aerial photographs p 48 A87-42257
bicolor p 7 A87-38097	with the operational planning of studies carried out with	Improvement of image quality by forward motion
OPTICAL PROPERTIES	a spacecraft p 56 A87-34208	compensation, a preliminary report p 42 N87-24741
Optical properties of the marine atmospheric boundary	PERFORMANCE PREDICTION	PHOTOMAPPING  Problems up the systematics of man compulation
layer - Aerosol profiles p 28 A87-42638	The operational performance of the fleet numerical	Problems in the automation of map-compilation processes on the basis of remote-sensing data
Optical dynamics experiment (ODEX) data report R/V	oceanography center global spectral ocean-wave model p 24 A87-38832	p 38 A87-35925
acania expedition 10 October-17 November 1982. Volume 2: Particle size distributions. Volume 6: Scalar	The Tethered Satellite System as a new remote sensing	The Denali image map p 38 A87-37288
spectral-radiometer data	platform p 46 A87-39183	Proposed changes to the Canadian camera calibration
(AD-A178535) p 32 N87-23104	PERIODIC VARIATIONS	report p 53 N87-24757
OPTICAL RADAR	Recurring polynyas over the Cosmonaut Sea and the	Wild Aviophot (TM) RC20 aerial camera system. The
Lidar observation of elevated pollution layers over Los	Maud Rise p 23 A87-37563	other approach to image motion compensation in aerial
Angeles p 13 A87-33292	PERMITTIVITY	photography p 54 N87-24782
OH measurement near the intertropical convergence	Radar scene generation for tactical decision aids	The production of photographs of the Earth's surface
zone in the Pacific p 21 A87-33430	[NASA-CR-180234] p 40 N87-20449	taken from satellites and their application in map production
Wave-measurement capabilities of the surface contour	NASA/MSFC large stretch press study	and map revision p 55 N87-24788
radar and the airborne oceanographic lidar	[NASA-CR-180376] p 41 N87-20554 PERSIAN GULF	Large format camera image analysis for mapping of land
p 25 A87-38840	Landsat image enhancement study of possible	use patterns in the region Noale - Musone, Po-River-Plain,
Wind and nadir angle effects on airborne lidar water	submerged sand-dunes in the Arabian Gulf	North Italy p 55 N87-24789
'surface' returns p 29 A87-42641	p 22 A87-35315	Estimating photogrammetric precision and cartographic
Energy Balance of the Tropical Systems (BEST): A space	PERTURBATION	potential of space imagery p 42 N87-24791
experiment proposition p 36 N87-22373	An atmospheric correction algorithm for remote	Large Format Camera photographs of the Black Hills,
Laser reflectance as a function of rough water glitter	identification of non-Lambertian surfaces and its range of	USA, and their suitability for topographic and thematic
profile	validity	mapping p 55 N87-24792
[AD-A178774] p 32 N87-23016	[DE87-096059] p 41 N87-24011	Earth observation experiments on the German Spacelab
OPTICAL SCANNERS	PERTURBATION THEORY	mission D2 p 55 N87-24811
A two-look technique for studying atmospheric effects	Radial orbit error reduction and sea surface topography determination using satellite altimetry	PHOTOSYNTHESIS
in optical scanner data for the ocean p 26 A87-39178	[NASA-CR-180570] p 33 N87-24816	Canopy reflectance, photosynthesis, and transpiration.
The Monocular Electro-Optical Stereo Scanner (MEOSS) satellite experiment p 55 N87-24812	PHASE DEVIATION	If - The role of biophysics in the linearity of their interdependence p 6 A87-37278
(MEOSS) satellite experiment p 55 N87-24812  OPTICAL TRANSFER FUNCTION	Relating polarization phase difference of SAR signals	PIGMENTS p 6 A67-37278
	to scene properties p 1 A87-31413	Coastal zone color scanner imagery of phytoplankton
Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems	PHOTOCHEMICAL REACTIONS	pigment distribution in Icelandic waters
p 51 N87-24742	OH measurement near the intertropical convergence	p 29 A87-42645
OPTIMIZATION	zone in the Pacific p 21 A87-33430	PLANKTON
Optimization of a program of experiments in connection	Measurements of nitric oxide in the boundary layer and	The interaction of light with phytoplankton in the marine
with the operational planning of studies carried out with	free troposphere over the Pacific Ocean	environment p 29 AR7-42640
a spacecraft p 56 A87-34208	PHOTOGEOLOGY p 21 A87-33431	The relationship between phytoplankton concentration
OPTOELECTRONIC DEVICES	The geometry of the intersections of tectonic structures	and light attenuation in ocean waters p 29 A87-42642

detected on satellite images p 17 A87-36104
The geostructural characteristics of the rift zone on the Lambert glacier (Antarctica) according to space images

Fault patterns by space remote sensing and the rotation of western Oregon during Cenozoic times

p 18 A87-36105

p 18 A87-36525

ORBIT CALCULATION

Synergistic use of MOMS-01 and Landsat TM data ---

Earth rotation, station coordinates and orbit determination from satellite laser ranging

p 46 A87-39190

p 43 A87-32349

Modular Optoelectronic Multispectral Scanner

SUBJECT INDEX			
PLANT STRESS			
Evaluation of the airborne imaging remote sensing of forest stand conditions.		tromete	r for
[NASA-CR-180918]		N87-2	2296
PLANTS (BOTANY) Inferring spectral reflectances of	olant e	lement	s hv
simple inversion of bidirect	ional	reflecta	ance
measurements PLOTTING	p 7	A87-31	7281
CHART: A computer plotting pack of position-dependent marine data	age for	the dis	play
[PB87-148607]	p 31	N87-2	2297
POLAR ORBITS	. Th		
AVHRR data services in Europ approach	р 39	A87-3	7922
A polar platform for the remote sens and agriculture - A view from the U.K.			
Proceedings of the European S			
	strumer	itation	for
Remote-Sensing (ESPOIR)   ESA-SP-266	p 48	N87-20	0621
Land panel report International	Space S	tation	
Occasion and among Internation		N87-20	
Ocean-ice panel report Internati	онан эрн р 30	N87-26	3635
POLAR REGIONS  An evaluation of the polar ice pred [AD-A178522]		stem N87-2:	3014
POLAR WANDERING (GEOLOGY)	•		
Polar motion-induced gravity	p 15	A87-3	5176
POLARIMETRY Interpretation of the polarimetric co	o-polariz	ation of	hase
term in radar images obtained with the	JPL airb	orne L-I	band
SAR system	p 36	A87-3	1412
POLARIZATION (WAVES)  Radar scene generation for tactica	decisio	n aids	
[NASA-CR-180234]		N87-20	0449
NASA/MSFC large stretch press s		NO7 0	
[NASA-CR-180376] POLARIZATION CHARACTERISTICS	p 41	N87-20	J554
Relating polarization phase differe	nce of	SAR siç	nals
to scene properties	p 1	A87-3	
Polarization, land use type and information variables in SAR mapping accuracy	Iraurban p 12		
Urban land use separability as a			
polarization		A87-3	
POLLUTION MONITORING			
Lidar observation of elevated pollu Angeles		ers ovei :A87-3	
Environmental protection from spa			
	p 13	A87-3	
Use of maps, aerial photographs sensor data for practical evaluations			
sites		A87-4	
POLLUTION TRANSPORT			
Continental shelf processes affecting of the South Atlantic Bight	ig the oc	eanogr	арпу
[DE87-005303]	p 30	N87-2	0716
POSEIDON SATELLITE	Droces-		
The French Space Oceanography	rogram	1 4077	2502

p 1 A87-31413 land use type and intraurban location as SAR mapping accuracy p 12 A87-32953 use separability as a function of radar p 14 A87-39188 ONITORING rvation of elevated pollution layers over Los p 13 A87-33292 ntal protection from space p 13 A87-36363 aps, aerial photographs, and other remote or practical evaluations of hazardous waste p 14 A87-42255 RANSPORT shelf processes affecting the oceanography Atlantic Bight p 30 N87-20716 TELLITE h Space Oceanography Program p 20 A87-32503 **POSITION (LOCATION)** CHART: A computer plotting package for the display of position-dependent marine data p 31 N87-22297 IPB87-1486071 POSITION INDICATORS Application of Global Positioning System (GPS) receivers for Earth observation p 53 N87-24763 POSITIONING A study of elevation measurement using LFC photograph p 43 A87-32491 Large Format Camera POSTLAUNCH REPORTS p 42 N87-24804 PRECIPITATION (METEOROLOGY) Relation between precipitation and brightness of earth surface in the NOAA/GVIP data p 3 A87-32498 Observation of precipitation from space by the weather p 44 A87-32507 Convective heating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982 Remote-sensing method for determining monthly precipitation sums using Meteor-satellite data on the p 21 A87-34447 PREDICTION ANALYSIS TECHNIQUES New dimension analyses with error analysis for quaking aspen and black spruce INASA-TM-892191 p 11 N87-24735 PREPROCESSING Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent [NASA-CR-180984] p 33 N87-24012

A modular and versatile acquisition, recording and preprocessing system for airborne remote sensing p 52 N87-24751 PRINCIPAL COMPONENTS ANALYSIS A software defoliant for geological analysis of band p 18 A87-39193 ratios PROBABILITY THEORY Predicting the location of kimberlite from a probability analysis of linear structure on remote sensing data p 18 A87-39186 PRODUCT DEVELOPMENT The first ESA remote sensing satellite (status and p 57 N87-24777 PRODUCTIVITY A review of national and international activities on modeling the effects of increased CO2 concentrations on the simulation of regional crop production. A report on linkage between climate and crop models [DE87-005994] p 10 N87-22336 PROVING DUCK '85 nearshore waves and currents experiment

data summary report (AD-A177419) p 31 N87-22382 **PULSED LASERS** Two-color short-pulse laser altimeter measurements of p 27 A87-39462 ocean surface backscatter PUSHBROOM SENSOR MODES Synergistic use of MOMS-01 and Landsat TM data ... Modular Optoelectronic Multispectral Scanner p 46 A87-39190 Definition of a thermal infrared pushbroom imager for p 53 N87-24765

The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager: Four years of operation p 53 N87-24767 The stereo pushbroom scanner system Digital

Earth observation

Photogrammetry System (DPS) and its accuracy p 53 N87-24768

# Q

**Q FACTORS** Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems o 51 N87-24742 QUALITY CONTROL

p 42 N87-24804 SPOT image quality Image quality problems in practical aerial photography p 43 N87-24814

# R

RADAR DATA Forest biomass, canopy structure, and species composition relationships with multipolarization L-band p 4 A87-35121 synthetic aperture radar data Simulation of wind gradient errors in NROSS (Navy Remote Ocean Sensing System) radar scatterometer data in a simplified geometry

p 49 N87-20642 IAD-A1757541 **RADAR ECHOES** VHF radar for ocean surface current and sea state

p 19 A87-31631 remote sensing The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data - A preliminary investigation p 35 A87-40249 RADAR EQUIPMENT

Preliminary results obtained by DMAAC from the processing of a limited set of GEOSAT satellite radar altimeter data p 50 N87-24734 IAD-A1790811

RADAR IMAGERY Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p 17 A87-31410 p 17 A87-31410 Multipolarization SAR data for surface feature

delineation and forest vegetation characterization p 1 A87-31411 Interpretation of the polarimetric co-polarization phase term in radar images obtained with the JPL airborne L-band

SAR system p 36 A87-31412 Relating polarization phase difference of SAR signals p 1 A87-31413 to scene properties Simulation software of synthetic aperture radar

Models for radar scatterer density in terrain images p 45 A87-35344 Rapid analysis of satellite radar images of sea ice

p 37 A87-32506

p 22 A87-35873 Some approaches for comparing remote and in-situ estimates of directional wave spectra

p 24 A87-38835 Spaceborne imaging radar research in the 1990s - An p 46 A87-38837

A practical methodology for estimating wave spectra p 25 A87-38841 from the SIR-B Radiometric correction of SAR images - A new correction D 40 A87-39184 algorithm Urban land use separability as a function of radar polarization p 14 A87-39188 The propagation of short surface waves on longer gravity p 28 A87 40835 Multilook images of ocean waves by synthetic aperture p 28 A87-41068 radars Rectification of terrain induced distortions in radai magery P 46 nor Radar scene generation for tactical decision aids p 48 A87-42254 p 40 N87-20449 [NASA-CR-180234] NASA/MSFC large stretch press study p 41 N87-20554 INASA-CR-180376 Radar as a complement to topographic maps for delineating marine terraces The effect of receiver amplifier non-linearity on ERS-1 p 52 N87-24755 synthetic aperture radar imagery RADAR MAPS

Introduction of geometric information to radar image p 42 N87-24754 RADAR MEASUREMENT

Nadir looking airborne radar and possible applications p 7 A87-38095 to forestry Airborne microwave Doppler measurements of ocean wave directional spectra p.26 A87-39180 Measured radar return at the near vertical from forested

IDE87-0093841 p 11 N87-24593 RADAR SCANNING

The Radar Ocean-Wave Spectrometer

p 25 A87-38846 RADAR SCATTERING

Models for radar scatterer density in terrain images p 45 A87-35344

RADAR TRACKING West Antarctic ice streams draining into the Ross Ice Shelf Configuration and mass balance

p 19 A87-31592 Lidar observation of elevated pollution layers over Los p 13 A87-33292 Angeles RADIANCE

GLAI estimation using measurements of red, near infrared, and middle infrared radiance p 4 A87-35119 Impact of radiance variations on satellite sensor

calibration p 47 A87-39457 RADIATION ABSORPTION Satellite sensing of aerosol absorption

p 47 A87-40770 **RADIATION DISTRIBUTION** 

Surface models including direct cross-radiation simple model of furrowed surfaces p 40 A87-39189 RADIATION EFFECTS

Impact of radiance variations on satellite calibration p 47 A87-39457 RADIATIVE TRANSFER

Canopy reflectance, photosynthesis, and transpiration II - The role of biophysics in the linearity of their p 6 A87-37278 interdependence The AVHRR/HIRS operational method for satellite

based sea surface temperature determination [NOAA-TR-NESDIS-28] p 31 N87-22388 Modelling of atmospheric effects on the angular distribution of a backscattering peak

[DE87-006060] p 41 N87-24014 **RADIO ALTIMETERS** 

The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface p 26 A87-39179

Preliminary results obtained by DMAAC from the processing of a limited set of GEOSAT satellite radar altimeter data

IAD-A1790811 p.50 N87-24734 RADIO NAVIGATION

Aircraft radiopositioning for airborne photography during hydrographic coastal surveys p 23 A87-36945 RADIO TELESCOPES

GINFEST - Geodetic intercomparison network for evaluating space techniques p 15 A87-36164 RADIOMETERS

AVHRR data services in Europe - The Earthnet p 39 A87-37922 approach Radiometric comparison of the Landsat-5 TM and MSS D 47 A87-41432 sensors A crop condition and crop yield estimation method based

on NOAA/AVHRR satellite data p 10 N87-22280 RADIOMETRIC CORRECTION

Calibration of satellite radiometers and the comparison p 2 A87-32091 of vegetation indices Correction for atmospheric and topographic effects on p 37 A87-32489 the Landsat MSS data Radiometric correction of SAR images - A new correction p 40 A87-39184

algorithm

the

RADIOMETRIC RESOLUTION
Deforestation in the tropics - New measurements in the
Amazon Basin using Landsat and NOAA advanced very
high resolution radiometer imagery p 4 A87-33441
Satellite detection of tropical burning in Brazil
p 8 A87-39191
Monitoring vegetation using Nimbus-7 scanning
mutichannel microwave radiometer's data
p 8 A87-39194 Comparison of North and South American biomes from
AVHRR observations p 9 A87-40303
The use of AVHRR data in operational agricultural
assessment in Africa p 9 A87-40304
Radiometric calibration of the Shuttle Imaging Radar
(SIR-C) system p 53 N87-24756
RAIN
Determining rainfall intensity and type from GOES
imagery in the midlatitudes p 34 A87-32092
On the relative accuracy of satellite and raingage rainfall measurements over middle latitudes during daylight
hours p 34 A87-33295
Cloud-cover and precipitation patterns over the Republic
of Guinea according to ground-based and satellite
observations p 35 A87-36102
Analysis of moderate and intense rainfall rates
continuously recorded over half a century and influence
on microwave communications planning and rain-rate data
acquisition p 46 A87-36933
The area-time-integral technique to estimate convective
rain volumes over areas applied to satellite data - A preliminary investigation p 35 A87-40249
Quick look Atlantic Ocean rain maps for gale
[NASA-CR-180511] p 30 N87-21533
Measurement and detection of precipitation. Satellite
methods in the visible and the infrared
p 36 N87-22364
RAIN FORESTS
Trace gas exchanges and transports over the
Amazonian rain forest p 12 A87-32196
RAIN GAGES
On the relative accuracy of satellite and raingage rainfall measurements over middle latitudes during daylight
hours p 34 A87-33295
REAL TIME OPERATION
Optical image subtraction techniques, 1975-1985
p 40 A87-42659
Real-time crop assessment using color theory and
satellite data p 10 N87-20619
RED SEA
Tectonic evaluation of the Nubian Shield of northeastern
Sudan using Thematic Mapper imagery
NASA-CR-180575   p 19 N87-22319   REFLECTANCE
Surface bidirectional reflectance properties of two
southwestern Arizona deserts for wavelengths between
0.4 and 2.2 micrometers
[NASA-TP-2643] p 49 N87-22281
Inversion of canopy reflectance models for estimation
of vegetation parameters
[NASA-CR-181059] p 12 N87-24737
REFLECTED WAVES
Wind and nadir angle effects on airborne lidar water
Surface returns p 25 Nor 42041
REGRESSION ANALYSIS  The regression intersection method of adjusting image
data for band rationg p 45 A87-35306
A technique to estimate the ocean surface energy flux
using VAS multispectral data p 30 N87-20710
Error analysis of leaf area estimates made from
allometric regression models
[NASA-TM-89220] p 11 N87-24010
RELIEF MAPS
Spaceborne imaging radar research in the 1990s - An
overview p 46 A87-38837 REMOTE SENSING
Signature-extendable technology - Global space-based
crop recognition p 1 A87-31414
VHF radar for ocean surface current and sea state
remote sensing p 19 A87-31631
Workshop on Space Remote Sensing for Agricultural
Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986,
Workshop on Space Remote Sensing for Agricultural

kangaroos TERS index data informations Finland Mapper data sensing simple

p 2 A87-32008

p 2 A87-32009

p 2 A87-32010

D 2 A87-32090

p 2 A87-32091

p 2 A87-32093

agricultural

approach

Stochastic nature of Landsat MSS data

a passive microwave sensor

Temporal observations of surface soil moisture using

Remote sensing methods of yield forecasting

meteorology at the Meteorological Service of the HPR

Influence of different nitrogen and irrigation treatments

Calibration of satellite radiometers and the comparison

Estimation of canopy parameters of row planted

vegetation canopies using reflectance data for only four

The application of remote sensing in

on the spectral reflectance of barley

of vegetation indices

view directions

Habitat mapping by Landsat for aerial census of Nadir looking airborne radar and possible applications p 2 A87-32094 p 7 A87-38095 to forestry The factor of scale in remote sensing Measurement of the surface emissivity of turbid p 19 A87-32097 p 39 A87-38096 Variations in the polarized leaf reflectance of Sorghum The Netherlands-Indonesian remote-sensing satellite p 43 A87-32210 picolor p 7 A87-38097 Measuring ocean waves from space. Proceedings of the Balloon borne infrared multichannel radiometer for Symposium, Johns Hopkins University, Laurel, MD. Apr remote sensing of high resolution low-level water vapor 15-17 1986 p 24 A87-38826 p 43 A87-32477 Some approaches for comparing remote and in-situ Australian utilization and research into remote sensing p 20 A87-32490 estimates of directional wave spectra p 24 A87-38835 Landcover change in Hiroshima during 1979/1984 Wave-measurement capabilities of the surface contour detected by Landsat MSS and TM data p 12 A87-32494 radar and the airborne oceanographic lidar Global vegetation monitoring using NOAA vegetation p 25 A87-38840 The Radar Ocean-Wave Spectrometer p 3 A87-32495 p 25 A87-38846 Fundamental study on systematization of selecting new development area with Landsat data and topographic Remotely-sensed tracers for hydrodynamic surface flow p 26 A87-39176 Itermations p 12 A87-32496 Earth resources satellite-1 (ERS-1) p 44 A87-32501 estimation A two-look technique for studying atmospheric effects United States remote sensing satellites (RSSs) past in optical scanner data for the ocean p 26 A87-39178 Airborne microwave Doppler measurements of ocean present, and future n 56 A87-32502 wave directional spectra p 26 A87-39180 Coral reef remote sensing applications p 20 A87-32951 Deriving surface albedo measurements from narrow band satellite data p 13 A87-39182 Applications of satellite microwave radiometry in inland p 44 A87-32952 The Tethered Satellite System as a new remote sensing p 56 A87-32955 p 46 A87-39183 Indian remote sensing programme platform Remote sensing of vegetation change near inco's Applied remote sensing --- Book p 45 A87-33122 Remote-sensing method for determining monthly p 8 A87-39185 Sudbury mining complexes Predicting the location of kimberlite from a probability precipitation sums using Meteor-satellite data on the analysis of linear structure on remote sensing data p 21 A87-34447 Atlantic Ocean p 18 A87-39186 French spot and the U.S. Landsat jockey for position in the race for a multimillion-dollar remote sensing market Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies ··· commercial prospects for Landsat and Spot imagery p 8 A87-39187 p 56 A87-34600 Surface models including direct cross-radiation - A GLAI estimation using measurements of red, near simple model of furrowed surfaces p 40 A87-39189 p 4 A87-35119 infrared, and middle infrared radiance Synergistic use of MOMS-01 and Landsat TM data ... identifying vegetable crops with Landsat Thematic Modular Optoelectronic Multispectral Scanner p 4 A87-35120 p 46 A87-39190 MIDAS - A new image-processing system for remote p 37 A87-35183 Satellite detection of tropical burning in Brazil p8 A87-39191 Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Thematic Mapper bandpass solar exoatmospheric ırradıances p 40 A87-39192 vegetation using Nimbus-7 scanning p 5 A87-35309 Monitoring Development of a satellité remote sensing technique mutichannel microwave radiometer's data p 34 A87-35311 for the study of alpine glaciers p8 A87-39194 The dependence of sea-surface microwave emission on High resolution remote sensing of spatially and spectrally wind speed, frequency, incidence angle, and polarization complex coal surface mines of central Pennsylvania - A comparison between simulated SPOT MSS and Landsat-5 over the frequency range from 1 to 40 GHz p 22 A87-35515 p 18 A87-39468 thematic mapper Seasonal and regional variations of active/passive and technologies for monitoring p 22 A87-35516 microwave signatures of sea ice p 14 A87-39593 Microwave sea-ice signatures near the onset of melt environment Spacelab data - A new contribution for structural p 22 A87-35517 The relation of millimeter-wavelength backscatter to interpretations of remotely sensed data in geology p 18 A87-39790 p 34 A87-35518 surface snow properties Concerning the relationship between evapotranspiration A soil thermal model for remote sensing p 8 A87-40244 p 5 A87-35521 and soil moisture Comparison of Landsat MSS and TM data for urban Airborne remote sensing of forest biomes p 9 A87-40301 land-use classification p 13 A87-35523 Problems in the automation of map-compilation Comparison of North and South Ame rican biomes from p 9 A87-40303 processes on the basis of remote-sensing data AVHRR observations The use of AVHRR data in operational agricultural p 38 A87-35925 p 9 A87-40304 assessment in Africa Measurement of the spatial spectrum of ocean waves using a two-frequency scatterometer p 23 A87-36107 Remote sensing applications in hydrology p 35 A87-40308 Remote sensing - Handling the data p 38 A87-36359 Recent research in snow hydrology p 35 A87-40309 p 38 A87-36361 Mapping from space Ice-edge eddies in the Fram Strait marginal ice zone Environmental protection from space p 27 A87-40432 p 13 A87-36363 Remote sensing of the Fram Strait marginal ice zone Fault patterns by space remote sensing and the rotation p 27 A87-40433 of western Oregon during Cenozoic times p 18 Remote sensing as a research tool --- sea ice surveillance from aircraft and spacecraft An application of low altitude multispectral photography p 28 A87-40648 to agricultural field trials p 6 A87-37054 Satellite sensing of aerosol absorption What, where, when ..., why? Extracting information from p 47 A87-40770 p 46 A87-37055 remote sensing data Inferring spectral reflectances of plant elements by Remote sensing of coastal wetlands p 9 A87-40944 inversion of bidirectional p 7 A87-37281 measurements Rice crop identification and area estimation using remotely-sensed data from Indian cropping patterns Landsat as an aid in evaluating the adequacy of a grain p 9 A87-41434 p 7 A87-37282 The application of remote sensing techniques in China Data Compression System for video images p 46 A87-37421 p 57 A87-41435 Physical principles of image convergence in remote Image preprocessing for line detection based on local p 40 A87-41925 structure analysis sensing p 39 A87-37801 Use of maps, aerial photographs, and other remote The Geomulti database management system p 39 A87-37802 sensor data for practical evaluations of hazardous waste p 14 A87-42255 Detection of Rift Valley fever viral activity in Kenya by atellite remote sensing imagery p 7 A87-37827 Remote sensing of chlorophyll concentrations in the satellite remote sensing imagery AVHRR data services in Europe The Earthnet northern Gulf of Mexico p 29 A87-42643 A model for the use of satellite remote sensing for the

n 39 A87-37922

p 46 A87-38093

p 7 A87-38094

measurement of primary production in the ocean

Sunlight induced 685 nm fluorescence imagery p 30 A87-42646

p 29 A87-42644

Radar scene generation for tactical decision aids	RUN TIME (COMPUTERS)	Applications of satellite microwave radiometry in
[NASA-CR-180234] p 40 N87-20449	Rapid analysis of satellite radar images of sea ice	Finland p 44 A87-32952
NASA/MSFC large stretch press study	p 22 A87-35873	Reflectance characteristics and its application in the
[NASA-CR-180376] p 41 N87-20554	•	classification of Nigerian Savanna soils p.3 A87-32954
Real-time crop assessment using color theory and satellite data p 10 N87-20619	S	Impact of satellite-based data on FGGE general
Proceedings of the European Symposium on Polar	CALIMITY	circulation statistics p 44 A87-32985
platform Opportunities and instrumentation for	Salinity effects on the microwave emission of soils	Deforestation in the tropics. New measurements in the
Remote-Sensing (ESPOIR)	p 5 A87-35520	Amazon Basin using Landsat and NOAA advanced very
ESA-SP-266  p 48 N87-20621	Continental shelf processes affecting the oceanography	high resolution radiometer imagery p 4 A87-33441
Remote sensing applications: Commercial issues and	of the South Atlantic Bight	French spot and the U.S. Landsat jockey for position in the race for a multimillion-dollar remote sensing market.
opportunities for space station SPOT p 57 N87-20626	DE87-005303  p 30 N8/-20716 SAMPLING	commercial prospects for Landsat and Spot imagery
Land panel report International Space Station	A crop condition and crop yield estimation method based	p 56 A87-34600
p 49 N87-20634	on NOAA/AVHRR satellite data p 10 N87-22280	MIDAS - A new image-processing system for remote
Potential of laser remote sensing of oil below water	Optical dynamics experiment (ODEX) data report R/V	sensing p 37 A87 35183
surface	acania expedition 10 October-17 November 1982 Volume 2. Particle size distributions Volume 6 Scalar	Automatic classification of Pointe d'Arcay landscapes
[FOA-C-30435-3.1] p 30 N87-20659	spectral-radiometer data	using Thematic Mapper data with the aid of a textural analysis p 37 A87-35305
Foundations and applications of multispectral scanning in agriculture	[AD-A178535] p 32 N87-23104	The topographic effect on Landsat data in gently
[NLR-MP-85015-U] p 10 N87-21408	SATELLITE ALTIMETRY	undulating terrain in southern Sweden p 4 A87-35307
Remotely sensed sea surface temperature for the Alpine	Biharmonic spline interpolation of GEOS-3 and Seasat altimeter data p 20 A87-32770	Development of a satellite remote sensing technique
Experiment (ALPEX) AVHRR-2 data	Use of satellite altimetry for ocean monitoring	for the study of alpine glaciers p 34 A87-35311
p 30 N87-21497 Comparative evaluation and quide for the integrated	p 23 A87-36101	A comparison of supervised maximum likelihood and decision tree classification for crop cover estimation from
utilization of LANDSAT (MSS and TM) and SPOT (HRV)	Spectrasat instrument design using maximum heritage	multitemporal Landsat MSS data p 5 A87-35312
satellites remotely sensed data	p 26 A87-38847 The Geosat altimeter mission - A milestone in satellite	A soil thermal model for remote sensing
[ETN-87-99356] p 41 N87-22278	oceanography p 27 A87-40281	p 5 A87-35521
Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457	Altimeter measurements for the determination of the	Comparison of Landsat MSS and TM data for urban land-use classification p 13 A87-35523
Active and passive remote sensing of ice	Earth's gravity field	Derivation of a fast algorithm to account for distortions
[AD-A179461] p 32 N87-24009	[NASA-CR-180520] p 17 N87-23033	due to terrain in earth-viewing satellite sensor images
Error analysis of leaf area estimates made from	Ocean wind and wave model comparisons with GEOSAT (GEOdesy SATellite) satellite data	p 38 A87-35524
allometric regression models	[AD-A178302] p 33 N87-24061	Rapid analysis of satellite radar images of sea ice
NASA-TM-89220 p 11 N87-24010 Proceedings of the International Symposium on Progress	Preliminary results obtained by DMAAC from the	p 22 A87-35873 Satellite techniques for studying ice crusts and
in Imaging Sensors	processing of a limited set of GEOSAT satellite radar	underground waters in the eastern Pamir
[ESA-SP-252] p 50 N87-24738	altimeter data [AD-A179081] p 50 N87-24734	p 35 A87-36106
Earth surface sensing in the '90's p 51 N87-24739	[AD-A179081] p 50 N87-24734  Radial orbit error reduction and sea surface topography	Remote sensing - Handling the data
Smart sensors: An overview and selected examples	determination using satellite altimetry	p 38 A87-36359 Mapping from space p 38 A87-36361
p 51 N87-24740 A modular and versatile acquisition, recording and	[NASA-CR-180570] p 33 N87-24816	Environmental protection from space
preprocessing system for airborne remote sensing	SATELLITE ATTITUDE CONTROL	p 13 A87-36363
p 52 N87-24751	Stereoscopic line scan imaging and satellite control [DGLR PAPER 86-106] p 38 A87-36757	Landform investigation utilizing digitally processed
The Multidetector Electro-optical Imaging Sensor (MEIS)	Infrared Earth horizon sensor concepts in various	satellite Thematic Mapper imagery p 38 A87-36546
2 pushbroom imager: Four years of operation p 53 N87-24767	spectral bands p 52 N87-24752	Stereoscopic line scan imaging and satellite control [DGLR PAPER 86-106] p 38 A87-36757
Estimating photogrammetric precision and cartographic	SATELLITE COMMUNICATION	Reconnaissance of vegetal formations in a Guinean
potential of space imagery p 42 N87-24791	Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence	forest sector by means of Landsat images
Earth observation experiments on the German Spacelab mission D2 p 55 N87-24811	on microwave communications planning and rain-rate data	p 6 A87-36946
mission D2 p 55 N87-24811 Modern CCD sensors and their applications in Earth	acquisition p 46 A87-36933	Preliminary report on the development of marine geographic information systems p 23 A87-37056
obse.va on and planetary missions p 55 N87-24813	SATELLITE DESIGN	Combining panchromatic and multispectral imagery from
Remote Sensing Information Sciences Research Group:	A Spectrasat system design based on the Geosat experiment p 26 A87-38848	dual resolution satellite instruments p 38 A87-37276
Santa Barbara Information Sciences Research Group, year 4	The first ESA remote sensing satellite (status and	Merging multiresolution SPOT HRV and Landsat TM data p 38 A87-37287
(NASA-CR-181073) p 43 N87-24817	outlook) p 57 N87-24777	The Denah image map p 38 A87-37288
REMOTE SENSORS	Earth Resources Satellite (ERS-1) project in Japan	Data Compression System for video images
Coral reef remote sensing applications	p 57 N87-24797 SATELLITE IMAGERY	p 46 A87-37421
p 20 A87-32951	Nimbus 7 SMMR investigation of snowpack properties	Multisatellite data processing p 39 A87-37803
Mid-infrared remote sensing systems and their application to lithologic mapping p 17 A87-35522	in the northern Great Plains for the winter of 1978-1979	Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p.7. A87-37827
Derivation of a fast algorithm to account for distortions	p 34 A87-31409	Stochastic nature of Landsat MSS data
due to terrain in earth-viewing satellite sensor images	Signature-extendable technology - Global space-based crop recognition p 1 A87-31414	p 46 A87-38093
p 38 A87-35524	The application of remote sensing in agricultural	The factor of scale in remote sensing
Sensors for imaging p 45 A87-36360 Space remote sensors p 47 A87-40379	meteorology at the Meteorological Service of the HPR	p 39 A87-38096 A two-look technique for studying atmospheric effects
Simulations of the GOES visible sensor to changing	p 2 A87-32010	in optical scanner data for the ocean p 26 A87-39178
surface and atmospheric conditions p 47 A87-40756	Determining rainfall intensity and type from GOES imagery in the midlatitudes p 34 A87-32092	Deriving surface albedo measurements from narrow
Ground and aerial use of an infrared video camera with	Habitat mapping by Landsat for aerial census of	band satellite data p 13 A87-39182
a mid-infrared filter (1.45 to 2.0 microns) p 48 A87-41588	kangaroos p 2 A87-32094	Remote sensing of vegetation change near Inco's Sudbury mining complexes p.8 A87-39185
Laser reflectance as a function of rough water glitter	Continental land cover assessment using Landsat MSS	Predicting the location of kimberlite from a probability
profile	data p 3 A87-32095	analysis of linear structure on remote sensing data
[AD-A178774] p 32 N87-23016	Landsat classification of Argentina summer crops p 3 A87-32098	p 18 A87-39186
Proceedings of the International Symposium on Progress in Imaging Sensors	The Netherlands-Indonesian remote-sensing satellite	Synergistic use of MOMS-01 and Landsat TM data Modular Optoelectronic Multispectral Scanner
[ESA-SP-252] p 50 N87-24738	TERS p 43 A87-32210	p 46 A87-39190
Earth surface sensing in the '90's p 51 N87-24739	Spectral classification of Landsat-5 Thematic Mapper	Monsoon flood boundary delineation and damage
Smart sensors: An overview and selected examples	data p 37 A87-32488  Correction for atmospheric and topographic effects on	assessment using space borne imaging radar and Landsat
p 51 N87-24740 Earth Resources Satellite (ERS-1) project in Japan	the Landsat MSS data p 37 A87-32489	data p 35 A87-39467  High resolution remote sensing of spatially and spectrally
p 57 N87-24797	Australian utilization and research into remote sensing	complex coal surface mines of central Pennsylvania - A
RESEARCH AND DEVELOPMENT	p 20 A87-32490	comparison between simulated SPOT MSS and Landsat-5
Indian remote sensing programme p 56 A87-32955	Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data	thematic mapper p 18 A87-39468
RICE	p 12 A87-32494	Concerning the relationship between evapotranspiration
Rice crop identification and area estimation using remotely-sensed data from Indian cropping patterns	Global vegetation monitoring using NOAA vegetation	and soil moisture p 8 A87-40244 Soil moisture estimation using GOES-VISSR infrared
p 9 A87-41434	index data p 3 A87-32495	data - A case study with a simple statistical method
ROBOTICS	Monitoring of snow and ice in Hokkaido Island using	p 8 A87-40248
Space remote sensors p 47 A87-40379	multitemporal NOAA-AVHRR data p 20 A87-32497 Relation between precipitation and brightness of earth	The area-time-integral technique to estimate convective
ROSS ICE SHELF West Antarctic ice streams draining into the Ross Ice	surface in the NOAA/GVIP data p 3 A87-32498	rain volumes over areas applied to satellite data - A preliminary investigation p 35 A87-40249
Shelf Configuration and mass balance	Coral reef remote sensing applications	The Geosat altimeter mission - A milestone in satellite
p 19 A87-31592	p 20 A87-32951	oceanography p 27 A87-40281

**SATELLITE INSTRUMENTS** SUBJECT INDEX

Montane vegetation stratification through Regional and seasonal variations of surface reflectance Simulation of wind gradient errors in NROSS (Navy processing of Landsat MSS data p 9 A87-40302 Remote Ocean Sensing System) radar scatterometer data from satellite observations at 0.6 micron The use of AVHRR data in operational agricultural p 27 A87-40250 in a simplified geometry assessment in Africa LAD-A1757541 p 9 A87-40304 p 49 N87-20642 Comparison of North and South American biomes from Ice-edge eddies in the Fram Strait marginal ice zone SCENE ANALYSIS AVHRR observations p 9 A87-40303 p 27 A87-40432 Relating polarization phase difference of SAR signals Satellite sensing of aerosol absorption A soil map through Landsat satellite imagery in a part p 47 A87-40770 to scene properties p 1 A87-31413 Automatic classification of Pointe d'Arcay landscapes of the Auranga catchment in the Ranchi and Palamou Report on the Special Program 78 satellite geodesy of districts of Bihar, India p 9 A87-41428 using Thematic Mapper data with the aid of a textural the Technical University of Munich The application of remote sensing techniques in China analysis p 37 A87 35305 (ASTRON-GEODAET-ARB-48) p 16 N87-20618 p 57 A87-41435 Report of the workshop on Assimilation of Satellite Wind Monitoring of snow and ice in Hokkaido Island using Physical principles of image convergence in remote and Wave Data in Numerical Weather and Wave Prediction p 40 A87-41925 multitemporal NOAA-AVHRR data p 20 A87-32497 sensing A model for the use of satellite remote sensing for the Seasonal and regional variations of active/passive IWCP-1221 p 49 N87-21521 p 22 A87-35516 measurement of primary plud iction in the ocean microwave signatures of sea ice A crop condition and crop yield estimation method based p 29 A87-42644 Microwave sea-ice signatures near the onset of melt on NOAA/AVHRR satellite data p 10 N87-22280 Quick look Atlantic Ocean rain maps for gale p 22 A87-35517 NASA-CR-180511] p 30 N87-21533 Possibilities of using artificial Earth satellite data for Measurement and detection of precipitation. Satellite [NASA-CR-180511] Rapid analysis of satellite radar images of sea ice methods in the visible and the infrared p 22 A87-35873 Recurring polynyas over the Cosmonaut Sea and the computing heat exchange between the ocean and p 36 N87-22364 Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457 p 23 A87-37563 atmosphere in Newfoundland energy-active zone during Maud Rise p 31 N87-21980 Ice-edge eddies in the Fram Strait marginal ice zone Tectonic evaluation of the Nubian Shield of northeastern p 27 A87-40432 SATELLITE SOUNDING Sudan using Thematic Mapper imagery [NASA-CR-180575] Remote sensing of the Fram Strait marginal ice zone Shuttle Imaging Radar (SIR-B) investigations of the p 17 A87-31410 p 27 A87-40433 p 19 N87-22319 Canadian shield - Initial Report Enhanced LANDSAT images of Antarctica and planetary Statistical description of the summertime ice edge in Cloud-cover and precipitation patterns over the Republic p 50 N87-23558 exploration the Chukchi Sea, task 2 of Guinea according to ground-based and satellite Utilizing remote sensing of thematic mapper data to [DE87-001056] p 31 N87-22387 p 35 A87-36102 improve our understanding of estuarine processes and Active and passive remote sensing of The possibility of using satellite measurements of their influence on the productivity of estuarine-dependent IAD-A1794611 p 32 N87-24009 methane in the atmosphere to study the global-distribution **SEA ROUGHNESS** fisheries p 13 A87-36125 characteristics of its sources [NASA-CR-180984] The present status of operational wave forecasting Monitoring vegetation using Nimbus-7 scanning p 24 A87-38831 LANDSAT-based inneament analysis. East Texas Basin. for ocean surface mutichannel microwave radiometer's data SEA STATES and structural history of the Sabine Uplift area, East Texas p 8 A87-39194 and North Louisiana VHF radar for ocean surface current and sea state SATELLITE TRACKING remote sensing LPB87-1763271 n 19 N87-24043 p 19 A87-31631 Earth rotation, station coordinates and orbit Laser reflectance as a function of rough water glitter High resolution sea surface temperature field derived determination from satellite laser ranging p 33 N87-24731 profile p 43 A87-32349 AD-A1787741 Comparative analysis of Thematic Mapper and SPOT p.32 N87-23016 Investigation of tectonic deformations using global atellite laser ranging data p 14 A87-33375 image data for land use investigation p 51 N87-24746 **SEA SURFACE TEMPERATURE** Application of Modular Optoelectronic Multispectral satellite laser ranging data A curious sea-surface-temperature Reports on cartography and geodesy, series 1, number observed by Meteosat p 19 A87-31572 Scanner (MOMS) data to hydrology and vegetation studies. Test site: Pantanal Region (Brazil/Paraguay) Measurement of the surface emissivity of turbid p 52 p 16 N87-22282 p 19 N87-24748 HSSN-0469-42361 A87-32097 Optical and digital SAR processing techniques: A SATELLITE-BORNE INSTRUMENTS Sea surface temperature measurement from space statistical comparison of accuracy using SEASAT allowing for the effect of the stratospheric aerosols Calibration of satellite radiometers and the comparison p 42 N87-24753 p 22 A87-35148 р2 of vegetation indices The stereo pushbroom scanner system Digital Long waves in the equatorial Atlantic Ocean during Derivation of a fast algorithm to account for distortions Photogrammetry System (DPS) and its accuracy p 23 A87-37564 due to terrain in earth-viewing satellite sensor images p 53 N87-24768 Comparison of satellite-derived p 38 A87-35524 sea surface temperatures with in situ skin measurements SPOT image quality p 42 N87-24804 GINFEST - Geodetic intercomparison network for Arctic Sea ice, 1973-1976: Satellite passive-microwave p 15 A87-36164 p 23 A87-37565 evaluating space techniques observations Sensors for imaging p 45 A87-36360 Satellite measurements of sea surface cooling during urricane Gloria p 24 A87-37886 [NASA-SP-489] p 33 N87-24870 Combining panchromatic and multispectral imagery from ual resolution satellite instruments p 38 A87-37276 hurricane Gloria SATELLITE INSTRUMENTS Remotely sensed sea surface temperature for the Alpine dual resolution satellite instruments Energy Balance of the Tropical Systems (BEST): A space A Spectrasat system design based on the Geosat Experiment (ALPEX) --- AVHRR-2 data p 30 N87-21497 p 26 A87-38848 experiment p 36 N87-22373 experiment proposition Impact of radiance variations on The 1982-1983 El Nino Atlas: Nimbus-7 microwave Definition of a thermal infrared pushbroom imager for p 47 A87-39457 calibration radiometer data Earth observation p 53 N87-24765 Advanced imaging spectrometer for ocean SATELLITE NETWORKS [NASA-CR-180914] p 31 N87-22386 The AVHRR/HIRS operational method for satellite Multisatellite data processing o 39 A87-37803 color/fluorescence measurements and further SATELLITE OBSERVATION p 33 N87-24766 based sea surface temperature determination [NOAA-TR-NESDIS-28] p 31 N87-22388 phenomenon A curious sea-surface-temperature The first ESA remote sensing satellite (status and p 19 A87-31572 outlook)
The Monocular Electro-Optical p 57 N87-24777 observed by Meteosat The impact of initial conditions and SST Anomalies on The French Space Oceanography Program extended range predictions for the El Nino period --- sea p 32 N87-23046 p 20 A87-32503 p 55 N87-24812 surface temperature (SST) On the relative accuracy of satellite and raingage rainfall SATELLITE-BORNE PHOTOGRAPHY High resolution sea surface temperature field derived measurements over middle latitudes during daylight hours p 34 A87-33295 The geostructural characteristics of the rift zone on the p 33 N87-24731 **SEA TRUTH** Lambert glacier (Antarctica) according to space images p 18 A87-36105 An evaluation of satellite-based insolation estimates for Comparison of satellite-derived Ohio p 34 A87-33297 temperatures with in situ skin measurements Statistical evaluation of forest characteristics from aerial Evaluation of a surface/vegetation parameterization p 23 A87-37565 and space photographs p 5 A87-36109 using satellite measurements of surface temperature The SIR-B mission: Towards an understanding of internal Aerial and space investigations of soils and vegetation p 3 A87-33298 p 6 A87-36579 waves in the ocean [ARE-TR-86122] Recurring polynyas over the Cosmonaut Sea and the p 32 N87-23102 SATELLITE-BORNE RADAR of satellite-derived sea ender of the period of satellite-derived sea Spaceborne imaging radar research in the 1990s - An SEA WATER p 46 A87-38837 Comparison Recurring polynyas over the Cosmonaut Sea and the temperatures with in situ skin measurements p 23 A87-37563 The physical basis for estimating wave-energy spectra p 23 A87-37565 The relationship between phytoplankton concentration with the radar ocean-wave spectrometer Detection of Rift Valley fever viral activity in Kenya by p 25 A87-38839 and light attenuation in ocean waters p 29 A87-42642 p 7 satellite remote sensing imagery A87-37827 Optical dynamics experiment (ODEX) data report R/V Monsoon flood boundary delineation and damage Satellite measurements of sea surface cooling during urricane Gloria p 24 A87-37886 assessment using space borne imaging radar and Lands acania expedition 10 October-17 November 1982. Volume p 35 A87-39467 hurricane Gloria 2: Particle size distributions. Volume 6: Scalar Comparison of HCMM and GOES satellite temperatures spectral-radiometer data SCALE (RATIO) p 39 A87-38098 and evaluation of surface statistics IAD-A1785351 p 32 N87-23104 The factor of scale in remote sensing The operational performance of the fleet numerical SEASAT SATELLITES p 39 A87-38096 Spectrasat - A hybrid ROWS/SAR approach to monitor oceanography center global spectral ocean-wave model SCATTERING COEFFICIENTS p 24 A87-38832 ocean waves from space p 25 A87-38845 Active and passive remote sensing of ice Recent results with a third-generation ocean-wave p 32 N87-24009 SEGMENTS IAD-A179461 p 24 A87-38833 SCATTEROMETERS An expert system for labeling segments in forward looking infrared (FLIR) imagery SHUTTLE IMAGING RADAR The microwave measurement of ocean-wave directional Observation of precipitation from space by the weath p 40 A87-42628 p 24 A87-38836 spectra p 44 A87-32507 Satellite detection of tropical burning in Brazil Seasonal and regional variations of active/passive Shuttle Imaging Radar (SIR-B) investigations of the p 8 A87-39191 p 17 A87-31410 Canadian shield - Initial Report microwave signatures of sea ice p 22 A87-35516

Measurement of the spatial spectrum of ocean waves

using a two-frequency scatterometer p 23 A87-36107

Spaceborne imaging radar research in the 1990s - An

p 46 A87-38837

environment

Strategies and technologies for monitoring the nvironment p 14 A87-39593

A practical methodology for estimating wave spectra from the SiR-B p 25 A87-38841	Procedures for the description of agricultural crops and	Investigation of simulated Monocular Electro-Optical
from the SIR-B p 25 A87-38841		
	soils in optical and microwave remote sensing studies	Stereo Scanner (MEOSS)-imagery for sensor navigation
The age and source of ocean swell observed in	p 8 A87-39187	and terrain derivation p 54 N87-24771
Hurricane Josephine p 25 A87-38843	SOILS	The production of photographs of the Earth's surface
Spectrasat - A hybrid ROWS/SAR approach to monitor	Salinity effects on the microwave emission of soils	taken from satellites and their application in map production
	p 5 A87-35520	
ocean waves from space p 25 A87-38845		and map revision p.55 N87-24788
The SIR-B mission. Towards an understanding of internal	SOLAR POSITION	Large format camera image analysis for mapping of land
waves in the ocean	Surface bidirectional reflectance properties of two	use patterns in the region Noale - Musone, Po-River-Plain,
ARE-TR-86122   p 32 N87-23102	southwestern Arizona deserts for wavelengths between	North Italy p 55 N87-24789
Radiometric calibration of the Shuttle Imaging Radar	0.4 and 2.2 micrometers	
(SIR-C) system p 53 N87-24756	[NASA-TP-2643] p 49 N87-22281	Estimating photogrammetric precision and cartographic
	SOLAR RADIATION	potential of space imagery p 42 N87-24791
SIDE-LOOKING RADAR		Large Format Camera photographs of the Black Hills.
Rectification of terrain induced distortions in radar	Computation of diffuse sky irradiance from	USA, and their suitability for topographic and thematic
magery p 48 A87-42254	multidirectional radiance measurements	mapping p 55 N87-24792
SIGNAL ANALYSIS	p 6 A87-37279	,, ,
Relating polarization phase difference of SAR signals	Thematic Mapper bandpass solar exoalmospheric	The Monocular Electro-Optical Stereo Scanner
to scene properties p 1 A87-31413	irradiances p 40 A87-39192	(MEOSS) satellite experiment p 55 N87-24812
	Satellite estimation of a solar irradiance at the surface	The Modular Optoelectronic Multispectral Scanner
The effect of a non-Gaussian point target response		(MOMS) program of the Bundesministerium fuer
function on radar altimeter returns from the sea surface	of the earth and of surface albedo using a physical model	
p 26 A87-39179	applied to Meteosat data p 47 A87-40246	Forschung und Technologie (BMFT) Milestones in the
SIGNAL DETECTION	A model for the use of satellite remote sensing for the	development of an operational Earth Observation
Active and passive remote sensing of ice	measurement of primary production in the ocean	system p 55 N87-24815
[AD-A179461] p 32 N87-24009	p 29 A87-42644	SPACELAB
SIGNAL DISTORTION	Modelling of atmospheric effects on the angular	Spacelab data - A new contribution for structural
	distribution of a backscattering peak	interpretations of remotely sensed data in geology
Rectification of terrain induced distortions in radar		
magery p 48 A87-42254	[DE87-006060] p 41 N87-24014	p 18 A87-39790
SIGNAL TO NOISE RATIOS	SORGHUM	SPACELAB PAYLOADS
Polarized views of the earth from orbital altitude	A crop condition and crop yield estimation method based	Earth observation experiments on the German Spacelab
p 48 A87-42639	on NOAA/AVHRR satellite data p 10 N87-22280	mission D2 p 55 N87-24811
•	SOUTH AMERICA	The Modular Optoelectronic Multispectral Scanner
SIGNATURE ANALYSIS	Comparison of North and South American biomes from	
Signature-extendable technology - Global space-based		(MOMS) program of the Bundesministerium fuer
crop recognition p 1 A87-31414	AVHRR observations p 9 A87-40303	Forschung und Technologie (BMFT) Milestones in the
SIMULATION	SOUTHERN CALIFORNIA	development of an operational Earth Observation
Simulation of wind gradient errors in NROSS (Navy	Lidar observation of elevated pollution layers over Los	system p 55 N87-24815
	Angeles p 13 A87-33292	SPATIAL DISTRIBUTION
Remote Ocean Sensing System) adar scatterometer data in a simplified geometry	SPACE BASED RADAR	
		Quantifying spatial and temporal variabilities of
[AD-A175754] p 49 N87-20642	Observation of precipitation from space by the weather	microwave brightness temperature over the U.S. Southern
A review of national and international activities on	radar p 44 A87-32507	Great Plains p 5 A87-35309
modeling the effects of increased CO2 concentrations on	SPACE COMMERCIALIZATION	Comparison of HCMA* and GOES satellite temperatures
the simulation of regional crop production. A report on	Arianespace top performance benefits ESA	and evaluation of surface statistics p 39 A87-38098
linkage between climate and crop models	p 57 N87-24493	
	SPACE EXPLORATION	Ten year change in forest succession and composition
[DE87-005994] p 10 N87-22336		measured by remote sensing
SKY RADIATION	Enhanced LANDSAT images of Antarctica and planetary	[NASA-CR-180948] p 11 N87-24736
Computation of diffuse sky irradiance from	exploration p 50 N87-23558	SPATIAL RESOLUTION
multidirectional radiance measurements	SPACE PLATFORMS	The factor of scale in remote sensing
p 6 A87-37279	A polar platform for the remote sensing needs of ecology	p 39 A87-38096
SNOW COVER	and agriculture - A view from the U.K p 9 A87-41430	SPECIFICATIONS
	Proceedings of the European Symposium on Polar	
Nimbus 7 SMMR investigation of snowpack properties		The role of government specifications in aerial
in the northern Great Plains for the winter of 1978-1979	platform Opportunities and Instrumentation for	photography p 57 N87-24780
p 34 A87-31409	Remote-Sensing (ESPOIR)	SPECTRAL BANDS
Monitoring of snow and ice in Hokkaido Island using	[ESA-SP-266] p 48 N87-20621	Thematic Mapper bandpass solar exoatmospheric
multitemporal NOAA-AVHRR data p 20 A87-32497	The Earth observation activities of the European Space	irradiances p 40 A87-39192
The relation of millimeter-wavelength backscatter to	Agency and the use of the polar platform of the	Comparative analysis of Thematic Mapper and SPOT
	International Space Station p 49 N87-20622	
surface snow properties p 34 A87-35518		image data for land use investigation p 51 N87-24746
Recent research in snow hydrology	Land panel report International Space Station	Infrared Earth horizon sensor concepts in various
p 35 A87 40309	p 49 N87-20634	spectral bands p 52 N87-24752
Active and passive remote sensing of ice	Ocean-ice panel report International Space Station	SPECTRAL ENERGY DISTRIBUTION
[AD-A179461] p 32 N87-24009	p 30 N87-20635	The physical basis for estimating wave-energy spectra
SOFTWARE TOOLS	COLOR CULTURE DAVI CADO	
	SPACE SHUTTLE PAYLUAUS	with the radar ocean-wave enectrometer
	SPACE SHUTTLE PAYLOADS  Scientific goals and technical limitations of the	with the radar ocean-wave spectrometer
Simulation software of synthetic aperture radar	Scientific goals and technical limitations of the	p 25 A87-38839
Simulation software of synthetic aperture radar p 37 A87-32506	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR	p 25 A87 38839 Phase portraits of vegetation development trajectories
Simulation software of synthetic aperture radar	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505	p 25 A87-38839
Simulation software of synthetic aperture radar p 37 A87-32506	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p. 44 A87-32505  Large format camera image arialysis for mapping of land	p 25 A87 38839 Phase portraits of vegetation development trajectories
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p. 44 A87-32505  Large format camera image arialysis for mapping of land	p 25 A87-38839  Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505 Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain,	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation  Russian book p 6 A87-36579  Global images of the earth's interior	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p. 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p. 55 N87-24789	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation p 6 A87-36579  Global images of the earth's interior p 15 A87-37918	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505 p 44 A87-32505 Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789 Large Format Camera photographs of the Black Hills,	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and imagation treatments on the spectral reflectance of barley p 2 A87-32090
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation p 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic	p 25 A87-38839  Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barrey p 2 A87-32090  Estimation of canopy parameters of row planted
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation p 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation p 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS	p 25 A87-38839  Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barrey p 2 A87-32090  Estimation of canopy parameters of row planted
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation p 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only louview directions p 2 A87-32093
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS	p 25 A87-38839  Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation p 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Friver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only our view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A67-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093 Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954 Canopy reflectance, photosynthesis, and transpiration
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Friver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only our view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A67-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093 Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954 Canopy reflectance, photosynthesis, and transpiration
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation p 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal vanabilities of	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions Reflectance characteristics and its application in the classification of Nigerian Savania soils  Canopy reflectance, photosynthesis, and transpiration if The role of biophysics in linearity of their interdependence  p 6 A87-37278
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains P 5 A87-35309	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets INASA-TM-878201 p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration if The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal vanabilities of microwave brightness temperature over the U.S. Southern Great Plains  P 5 A87-35309  Salinity effects on the microwave emission of soils	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal vanabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions  Reflectance characteristics and its application in the classification of Nigerian Savanna soils  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements  p 2 A87-3281
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal vanabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32090  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A67-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils  p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence. Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior  p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal vanabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum p 7 A87-38097  Thematic Mapper bandpass solar exoatmospheric
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U S. Southern Great Plains p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A67-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils  p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence. Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal vanabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Fliver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-3728  Vanations in the polarized leaf reflectance of Sorghum bicolor  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets INASA-TM-878201 p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-34291  Surface maintestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6'	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A67-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Variations in the polarized leaf reflectance of Sorghum picolor p 7 A87-38097  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Regional and seasonal variations of surface reflectance
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior  p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal vanabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture p 7 A87-40244	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Fliver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture estimation using GOES-VISSR infrared	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain, North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only douved we directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il - The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097  Thematic Mapper bandpass solar exactinospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron p 27 A87-40250
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Fliver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103  The geometry of the intersections of tectonic structures	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37891  Variations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron p 27 A87-40250  Reflectivity of earth's surface and clouds in ultraviolet
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture estimation using GOES-VISSR infrared	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Fliver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to "Salyut-6" photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only douved we directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il - The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097  Thematic Mapper bandpass solar exactinospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron p 27 A87-40250
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets INASA-TM-878201 p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to Salyut-6 photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data A new contribution for structural	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the interrity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-39097  Thematic Mapper bandpass solar exoatmospheric radiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron p 27 A87-40250  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations p 4. A87-40768
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture p 8 A87-40244  Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Fliver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to "Salyut-6" photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only obtained with the spectral reflectance and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097  Thematic Mapper bandpass solar exactionspheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations p 4 A87-4050  Reflectivity of earth's surface and clouds in uttraviolet from satellite observations p 4 A87-40768  Evaluation of the airborne imaging spectrometer for
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35520  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets INASA-TM-878201 p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to Salyut-6 photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data A new contribution for structural	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions p 2 A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration if in The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements Vanations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-3093  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron p 27 A87-40250  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations in p 4. A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior  I p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture p 8 A87-40244  Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Fliver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-67820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to "Salyut-6" photographs  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data - A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions  Reflectance characteristics and its application in the classification of Nigerian Savanna soils  p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements  p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bioolor  Thematic Mapper bandpass solar exoatmospheric gradiances  Regional and seasonal vanations of surface reflectance from satellitie observations at 0.6 micron  p 27 A87-40250  Reflectivity of earth's surface and clouds in ultraviolet from satellitie observations  p 4. A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  [NASA-CR-180918]  p 10 N87-2296
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation Russian book p 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture p 8 A87-40244  Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions INASA-CR-180918  p 10 N87-22296	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets INASA-TM-878201 p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-34291  SURface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790  Phase portraits of vegetation development trajectories	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only obtained with the classification of Nigerian Savania soils p 3 A87-3293  Reflectance characteristics and its application in the classification of Nigerian Savania soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum biolor  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron  p 27 A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  INASA-CR-180918  p 10 N87-22296  Determination of spectral reflectance of crops during
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-36994  Concerning the relationship between evapotranspiration and soil moisture = stimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  [NASA-CR-180918] p 10 N87-22296  SOIL SCIENCE  Reflectance characteristics and its application in the	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data - A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790  Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p. 10. A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and imagation treatments on the spectral reflectance of barley. p. 2. A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions. p. 2. A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils. p. 3. A87-32954  Canopy reflectance, photosynthesis, and transpiration. II. The role of biophysics in the linearity of their interdependence. p. 6. A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements. p. 7. A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor. p. 7. A87-38997  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron. p. 27. A87-40250  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations. p. 4. A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions. INASA-CR-180918]. p. 10. N87-2296  Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture p 8 A87-40244  Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions INASA-CR-180918 p 10 N87-22296  SOIL SCIENCE  Reflectance characteristics and its application in the classification of Nigerian Savanna soils	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets INASA-TM-878201 p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-34291  SURface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790  Phase portraits of vegetation development trajectories	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only obtained with the classification of Nigerian Savania soils p 3 A87-3293  Reflectance characteristics and its application in the classification of Nigerian Savania soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum biolor  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron  p 27 A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  INASA-CR-180918  p 10 N87-22296  Determination of spectral reflectance of crops during
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-36994  Concerning the relationship between evapotranspiration and soil moisture = stimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  [NASA-CR-180918] p 10 N87-22296  SOIL SCIENCE  Reflectance characteristics and its application in the	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data - A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790  Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p. 10. A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and imagation treatments on the spectral reflectance of barley. p. 2. A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions. p. 2. A87-32093  Reflectance characteristics and its application in the classification of Nigerian Savanna soils. p. 3. A87-32954  Canopy reflectance, photosynthesis, and transpiration. II. The role of biophysics in the linearity of their interdependence. p. 6. A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements. p. 7. A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor. p. 7. A87-38997  Thematic Mapper bandpass solar exoatmospheric irradiances. p. 40. A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron. p. 27. A87-40250  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations. p. 4. A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions. INASA-CR-180918]. p. 10. N87-2296  Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior  p 15 A87-37918  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture p 8 A87-40244  Soil moisture estimation using GOES-VISSR infrared data A case study with a simple statistical method p 8 A87-40244  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  INASA-CR-1809181 p 10 N87-22296  SOIL SCIENCE  Reflectance characteristics and its application in the classification of Nigerian Savanna soils	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Riiver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph Large Format Camera p 43 A87-32491  Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6' photographs p 35 A87-36103  The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104  Spacelab data - A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790  Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-41771  SPECTRAL REFLECTANCE p 10 A87-3299  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32990  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only louview directions p 2 A87-3293  Reflectance characteristics and its application in the classification of Nigerian Savania soils p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration il. The role of biophysics in the linearity of their interdependence p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bioclor  Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron  p 27 A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  INASA-CR-180918 p 10 N87-2296  Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography  SPECTROPHOTOMETRY
Simulation software of synthetic aperture radar p 37 A87-32506  SOIL MAPPING  Aerial and space investigations of soils and vegetation P 6 A87-36579  Global images of the earth's interior  A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428  SOIL MOISTURE  Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298  Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309  Salinity effects on the microwave emission of soils p 5 A87-35520  A soil thermal model for remote sensing p 5 A87-35521  Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094  Concerning the relationship between evapotranspiration and soil moisture p 8 A87-40244  Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method p 8 A87-40248  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions INASA-CR-180918 p 10 N87-22296  SOIL SCIENCE  Reflectance characteristics and its application in the classification of Nigerian Savanna soils	Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Large format camera image arialysis for mapping of land use patterns in the region Noale - Musone, Po-Fliver-Plain. North Italy p 55 N87-24789  Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792  SPACE STATIONS  Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457  SPACEBORNE EXPERIMENTS  Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p 44 A87-32505  Optimization of a program of experiments in connection with the operational planning of studies carried out with a spacecraft p 56 A87-34208  SPACEBORNE PHOTOGRAPHY  A study of elevation measurement using LFC photograph	Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space p 10 A87-41771  SPECTRAL REFLECTANCE  Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090  Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four view directions  Reflectance characteristics and its application in the classification of Nigerian Savanna soils  p 3 A87-32954  Canopy reflectance, photosynthesis, and transpiration if the role of biophysics in the linearity of their p 6 A87-37278  Inferring spectral reflectances of plant elements by simple inversion of bidirectional reflectance measurements  p 7 A87-37281  Vanations in the polarized leaf reflectance of Sorghum bicolor  p 7 A87-38097  Thematic Mapper bandpass solar exoatmospheric gradiances  p 40 A87-39192  Regional and seasonal vanations of surface reflectance from satellite observations at 0.6 micron  p 27 A87-40250  Reflectivity of earth's surface and clouds in ultraviolet from satellite observations  p 4. A87-40768  Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions  [NASA-CR-180918]  Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography  p 12 N87-24801

SPECTRORADIOMETERS	Tectonic evaluation of the Nubian Shield of northeastern	Multilook images of ocean waves by synthetic aperture
Influence of different nitrogen and irrigation treatments	Sudan using Thematic Mapper imagery (NASA-CR-180575) p.19 N87-22319	radars p.28 A87-41068 The effect of receiver amplifier non-linearity on ERS-1
on the spectral reflectance of barley p.2. A87-32090. Evaluation of the airborne imaging spectrometer for	[NASA-CR-180575] p 19 N87-22319 Radar as a complement to topographic maps for	syr etic aperture radar imagery p 52 N87 24755
remote sensing of forest stand conditions	delineating marine terraces	
[NASA-CR-180918] p.10 N87-22296	[PB87-154597] p.41 N87-24013	Ť
SPECTRUM ANALYSIS A Spectrasat system design based on the Geosat	LANDSAT based lineament analysis. East Texas Basin.	•
experiment p 26 A87-38848	and structural history of the Sabine Uplift area. East Texas and North Louisiana	TARGET ACQUISITION
SPECULAR REFLECTION	PB87-176327   p.19 Ne7-24043	An expert system for labeling segments in forward
Laser reflectance as a function of rough water glitter	SUBTRACTION	looking infrared (FLIR) imagery p 40 A87-42628 TARGET RECOGNITION
profile  AD-A178774† p.32 N87-23016	Optical image subtraction techniques, 1975-1985	The integration of spectral and spatial analysis for land
SPLINE FUNCTIONS	p 40 A87-42659	use classification
Biharmonic spline interpolation of GEOS-3 and Seasat	SUDAN Tectonic evaluation of the Nubian Shield of northeastern	[AD-A178703] p 14 N87-23015
altimeter data p 20 A87-32770	Sudan using Thematic Mapper imagery	TECHNOLOGICAL FORECASTING  Earth surface sensing in the 90's p.51 N87-24739
SPOT (FRENCH SATELLITE) French spot and the U.S. Landsat jockey for position	[NASA-CR-180575] p 19 N87-22319	TECHNOLOGY ASSESSMENT
in the race for a multimillion-dollar remote sensing market	SUNLIGHT	Very high resolution aerial films p 54 N87-24776
commercial prospects for Landsat and Spot imagery	Sunlight induced 685 nm fluorescence imagery p 30 A87-42646	TECHNOLOGY UTILIZATION  European utilization aspects studies ··· space stations
p 56 A87-34600	SUPERHIGH FREQUENCIES	European utilization aspects studies ··· space stations p 49 N87-20624
First results of tateritic cover mapping with SPOT images The Kangaba region (South-Mali) p 18 A87-36925	Scientific goals and technical limitations of the	TECTONICS
Combining panchromatic and multispectral imagery from	shuttleborne synthetic aperture experiment X-SAR	Investigation of tectonic deformations using global
dual resolution satellite instruments p 38 A87-37276	p 44 A87-32505	satellite laser ranging data p. 14 A8 33375.  The geometry of the intersections of tectonic sturctures.
Remote sensing of coastal wetlands	SURFACE DISTORTION	detected on satellite images p 17 A87-3c 104
p 9 A87-40944  Remote sensing applications, Commercial issues and	Rectification of terrain induced distortions in radar imagery p 48 A87-42254	GPS-based geodesy in California. Mexico and the
opportunities for space station SPOT	SURFACE LAYERS	Caribbean p 16 A87-41380
p 57 N87-20626	Remotely-sensed tracers for hydrodynamic surface flow	Tectonic evaluation of the Nubian Shield of northeastern Sudan using Thematic Mapper imagery
Comparative evaluation and guide for the integrated	estimation p 26 A87-39176	[NASA-CR-180575] p 19 N87-22319
utilization of LANDSAT (MSS and TM) and SPOT (HRV) satellites remotely sensed data	Studies of the east Australian current off northern New South Wales	TELEVISION CAMERAS
[ETN-87-99356] p 41 N87-22278	AD-A1784611 p. 32 N87-23103	Ground and herial use of an infrared video camera with
Comparative analysis of Thematic Mapper and SF T	SURFACE NAVIGATION	a faud-infrared filter (1.45 to 2.0 microns) p.48 A87-41588
image data for land use investigation p.51 N87-24/46 SPOT image quality p.42 N87-24804	Applitation of Global Positioning System (GPS)	TEMPERATURE DISTRIBUTION
SPOT image quality p 42 N87-24804 STANDARDIZATION	receive for Earth observation p 53 N87-24763 SURFACE PROPERTIES	Continental shelf processes affecting the oceanography
Thoughts on a standard algorithm for camera	Deriving surface albedo measurements from narrow	of the South Atlantic Bight
calibration p 51 N87-24743	band satellite data p 13 A87-39182	[DE87-005303] p 30 N87-20716
STATISTICAL ANALYSIS	SURFACE ROUGHNESS	High resolution sea surface temperature field derived p 33 N87-24731
Some observations on crop profile modelling p 5 A87-35310	Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on	TEMPERATURE MEASUREMENT
Predicting the location of kimberlite from a probability	light scattering p 12 A87-32493	Measurement of the surface emissivity of turbid
analysis of linear structure on remote sensing data	Surface models including direct cross-radiation - A	waters p 19 A87-32097 Sea surface temperature measurement from space
p 18 A87-39186	simple model of furrowed surfaces p 40 A87-39189	allowing for the effect of the stratospheric aerosols
Earth science research [NASA-CR-180512] p.11 N87-24733	Laser reflectance as a function of rough water glitter profile	p 22 A87-35148
STATISTICAL WEATHER FORECASTING	[AD-A178774] p 32 N87-23016	TEMPORAL DISTRIBUTION
Impact of satellite-based data on FGGE general	SURFACE TEMPERATURE	Quantifying spatial and temporal variabilities of
circulation statistics p 44 A87-32985	Evaluation of a surface/vegetation parameterization	microwave brightness temperature over the U.S. Southern Great Plains p.5 A87-35309
STEREOPHOTOGRAPHY The stereo pushbroom scanner system Digital	using satellite measurements of surface temperature p.3 A87-33298	TEMPORAL RESOLUTION
Photogrammetry System (DPS) and its accuracy	A soil thermal model for remote sensing	Temporal observations of surface soil moisture using
p 53 N87-24768	p 5 A87-35521	a passive microwave sensor p 7 A87-38094 TERRAIN
STEREOSCOPY	Comparison of HCMM and GOES satellite temperatures	Measured radar return at the near vertical from forested
Stereoscopic line scan imaging and satellite control [DGLR PAPER 86-106] p 38 A87-36757	and evaluation of surface statistics p 39 A87-38098 SURFACE WAVES	terrains
Investigation of simulated Monocular Electro-Optical	The present status of operational wave forecasting	[DE87-009384] p 11 N87-24593
Stereo Scanner (MEOSS)-imagery for sensor navigation	for ocean surface p 24 A87-38831	TERRAIN ANALYSIS  Models for radar scatterer density in terrain images
and terrain derivation p 54 N87-24771 STOCHASTIC PROCESSES	A practical methodology for estimating wave spectra	p 45 A87-35344
Stochastic nature of Landsat MSS data	from the SIR-B p 25 A87-38841 The propagation of short surface waves on longer gravity	Phase portraits of vegetation development trajectories
p 46 A87-38093	waves p 28 A87-40835	in a multidimensional spectral attribute space
STRAITS	SYNOPTIC MEASUREMENT	p 10 A87-41771 Investigation of simulated Monocular Electro-Optical
Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salyut-6'	Use of satellite altimetry for ocean monitoring	Stereo Scanner (MEOSS)-imagery for sensor navigation
photographs p 35 A87-36103	p 23 A87-36101 SYNOPTIC METEOROLOGY	and terrain derivation p 54 N87-24771
Ice-edge eddies in the Fram Strait marginal ice zone	World-wide weather Book p 56 A87-33125	TETHERED SATELLITES
p 27 A87-40432	SYNTHETIC APERTURE RADAR	The Tethered Satellite System as a new remote sensing platform p 46 A87-39183
Remote sensing of the Fram Strait marginal ice zone	Multipolarization SAR data for surface feature	TEXAS
p 27 A87-40433 Mesoscale oceanographic processes beneath the ice	delineation and forest vegetation characterization p.1. A87-31411	LANDSAT-based lineament analysis, East Texas Basin,
of Fram Strait p 28 A87-40434	Interpretation of the polarimetric co-polarization phase	and structural history of the Sabine Uplift area, East Texas
STRATIFICATION	term in radar images obtained with the JPL airborne L-band	and North Louisiana [PB87-176327] p. 19 N87-24043
Montane vegetation stratification through digital	SAR system p 36 A87-31412	TEXTURES
processing of Landsat MSS data p 9 A87-40302	Relating polarization phase difference of SAR signals to scene properties p 1 A87-31413	Automatic classification of Pointe d'Arcay landscapes
STRATOSPHERE	Scientific goals and technical limitations of the	using Thematic Mapper data with the aid of a textural
Sea surface temperature measurement from space allowing for the effect of the stratospheric aerosols	shuttleborne synthetic aperture experiment X-SAR	analysis p 37 A87-35305 The integration of spectral and spatial analysis for land
p 22 A87-35148	p 44 A87-32505 Simulation software of synthetic aperture radar	use classification
STRUCTURAL ANALYSIS	p 37 A87-32506	[AD-A178703] p 14 N87-23015
LANDSAT-based lineament analysis, East Texas Basin,	Polarization, land use type and intraurban location as	THEMATIC MAPPING  Workshop on Space Remote Spacing for Agricultural
and structural history of the Sabine Uplift area, East Texas and North Louisiana	variables in SAR mapping accuracy p 12 A87-32953	Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986.
[PB87-176327] p 19 N87-24043	Forest biomass, canopy structure, and species	Proceedings p.1 A87-32007
STRUCTURAL PROPERTIES (GEOLOGY)	composition relationships with multipolarization L-band	Spectral classification of Landsat-5 Thematic Mapper
Fault patterns by space remote sensing and the rotation	synthetic aperture radar data p 4 A87-35121	
of western Oregon during Cenozoic times	synthetic aperture radar data p 4 A87-35121  Determination of the velocity of ocean gyres through	data p 37 A87-32488
n 18 A97 36636	Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87-35314	Landcover change in Hiroshima during 1979/1984
p 18 A87-36525 Image preprocessing for line detection based on local	Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87.35314 Spectrasat instrument design using maximum heritage	
p 18 A87-36525 Image preprocessing for line detection based on local structure analysis p 39 A87-37801	Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87-35314 Spectrasat instrument design using maximum heritage p 26 A87-38847	Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data
Image preprocessing for line detection based on local structure analysis p 39 A87-37801 Spacelab data - A new contribution for structural	Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87-35314 Spectrasat instrument design using maximum heritage p 26 A87-38847 Radiometric correction of SAR images - A new correction algorithm p 40 A87-39184	Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data p 12 A87-32494  Polarization, land use type and intraurban location as variables in SAR mapping accuracy p 12 A87-32953
Image preprocessing for line detection based on local structure analysis p 39 A87-37801	Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87-35314 Spectrasat instrument design using maximum heritage p 26 A87-38847 Radiometric correction of SAR images. A new correction	Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data p 12 A87-32494 Polarization, land use type and intraurban location as

Earth rotation station coordinate determination from satellite laser ranging

The AVHRR HIRS operational method for satellite based sea surface temperature determination.

TRANSFER FUNCTIONS

NOAA TRINESDIS 28

station coordinates and orbit

p 31 N87 22388

p.6 A87-36946

p 13 A87-37277

p 52 N87-24748

p 7 A87-38097

p.8 A87-39185

p 18 A87-39193

ρ8 A87-39194

through digital

p.9 A87-40302

p 9 A87-40303

p 11 N87-24736

p 2 A87-32091

p 2 A87-32093

p 3 A87-32495

p 3 A87-32498

p.3 A87-33298

p 20 A87-32976

p 28 A87-42638

p 11 N87-24593

p 19 A87-31631

p 15 A87-36166

p 46 A87-37421

p 48 A87-41588

p 32 N87-23016

p 47 A87-39457

p.8 A87-39187

p.7 A87-38094

p 14 N87 23015

A87-37827

Reconnaissance of vegetal formations in a Guinean **TRANSPIRATION** Automatic classification of Pointe d'Arcay landscapes Canopy reflectance, photosynthesis, and transpiration using Thematic Mapper data with the aid of a textural forest sector by means of Landsat images p 37 A87-35305 II - The role of biophysics in the linearity of their p 6 A87-37278 interdependence Testing the consistency for mapping urban vegetation The topographic effect on Landsat data in gently undulating terrain in southern Sweden p 4 A87-35307 TREES (PLANTS) with high-altitude aerial photographs and Landsat MSS Earth science research data Landform investigation utilizing digitally processed NASA-CR-1805121 p 11 N87-24733 p 38 A87-36546 Application of Modular Optoelectronic Multispectral satellite Thematic Mapper imager TRIANGULATION Scanner (MOMS) data to hydrology and vegetation studies Combining panchromatic and multispectral imagery from Aerotriangulation without ground control Test site Pantanal Region (Brazil Paraguay) dual resolution satellite instruments p 38 A87-37276 p 46 A87-37289 An assessment of Landsat MSS and TM data for urban The effects of camera position and attitude data in aerial and near-urban land-cover digital classification **VEGETATION GROWTH** triangulation, a simulation study p 52 N87-24750 Variations in the polarized leaf reflectance of Sorghum p 13 A87-37280 Aerial triangulation of CCD line-scanner images bicolor Merging multiresolution SPOT HRV and Landsat TM p 54 N87-24769 Remote sensing of vegetation change near Inco's p 38 A87-37287 data TROPICAL METEOROLOGY Sudbury mining complexes Cloud-cover and precipitation patterns over the Republic Global images of the earth's interior A software defoliant for geological analysis of band p 15 A87-37918 of Guinea according to ground-based and satellite Remote sensing of vegetation change near Inco's p 35 A87-36102 ratios observations Monitoring vegetation using Nimbus-7 scanning Sudbury mining complexes p8 A87-39185 Measurement and detection of precipitation. Satellite mutichannel microwave radiometer's data methods in the visible and the infrared Thematic Mapper bandpass solar exoatmospheric p 40 A87-39192 irradiances TROPICAL REGIONS Montane vegetation stratification Radiometric comparison of the Landsat-5 TM and MSS p 47 A87-41432 processing of Landsat MSS data Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very Comparison of North and South American biomes from Reports on cartography and geodesy, series 1, number high resolution radiometer imagery p 4 A87-33441 AVHRR observations p 16 N87-22286 Satellite detection of tropical burning in Brazil HSSN-0469-42361 Ten year change in forest succession and composition p 8 A87-39191 Tectonic evaluation of the Nubian Shield of northeastern measured by remote sensing Sudan using Thematic Mapper imagery Measurement and detection of precipitation. Satellite (NASA-CR-180948) methods in the visible and the infrared [NASA-CR-180575] p 19 N87-22319 VEGETATIVE INDEX Utilizing remote sensing of thematic mapper data to p 36 N87-22364 Calibration of satellite radiometers and the comparison Energy Balance of the Tropical Systems (BEST): A space improve our understanding of estuarine processes and of vegetation indices p 36 N87-22373 experiment proposition their influence on the productivity of estuarine-dependent Estimation of canopy parameters of row planted TROPOSPHERE fisheries vegetation canopies using reflectance data for only four Operational overview of NASA GTE/CITE 1 airborne NASA-CR-180984 p 33 N87-24012 view directions instrument intercomparisons - Carbon monoxide, nitric Spatial characterization of acid rain stress in Canadian Global vegetation monitoring using NOAA vegetation oxide, and hydroxyl instrumentation --- Global Tropospheric Shield lakes index data Test p 36 N87-24031 Experiment/Chemical Instrumentation [NASA-CR-180983] Relation between precipitation and brightness of earth p 45 A87-33426 Farth science research surface in the NOAA GVIP data OH measurement near the intertropical convergence INASA-CR-1805121 p 11 N87-24733 p 21 A87-33430 zone in the Pacific Evaluation of a surface/vegetation parameterization Comparative analysis of Tilematic Mapper and SPOT Measurements of nitric oxide in the boundary layer and using satellite measurements of surface temperature image data for land use investigation in 51 N87-24746 Towards an automatic identification of urban textures free troposphere over the Pacific Ocean p 21 A87-33431 GLAI estimation using measurements of red, near higher and middle infrared radiance - p.4 - A87-35119 p 14 N87-24747 Free tropospheric and boundary layer measurements Application of Modular Optoelectronic Multispectral of NO over the central and eastern North Pacific Ocean Scanner (MOMS) data to hydrology and vegetation studies. VERTICAL AIR CURRENTS p 21 A87-33432 Test site: Pantanal Region (Brazil/Paraguay) Observations of intermittent cumulus convection in the p 52 N87-24748 Carbon morioxide measurements over the eastern boundary lave Pacific during GTE/CITE 1 --- Chemical Instrumentation TIROS SATELLITES VERTICAL DISTRIBUTION Test and Evaluation p 21 A87-33435 United States remote sensing satellites (RSSs) past Optical properties of the marine atmospheric boundary p 56 A87-32502 THRRIDITY layer - Aerosol profiles present, and future Measurement of the surface emissivity of turbid **TOPEX** VERTICAL ORIENTATION p 19 A87-32097 Measured radar return at the near vertical from intested The French Space Oceanography Program p 20 A87-32503 IDE87-0093841 Spectrasat instrument design using maximum heritage VERY HIGH FREQUENCIES p 26 A87-38847 VHF radar for ocean surface current and sea state UF SPACE PROGRAM Correction for atmospheric and topographic effects on remote sensing A polar platform for the remote sensing needs of ecology p 37 A87-32489 VERY LONG BASE INTERFEROMETRY the Landsat MSS data and agriculture A view from the U K p 9 A87-41430 ULTRAVIOLET RADIATION Fundamental study on systematization of selecting new Creation of a global geodetic network using Mark III VLBI development area with Landsat data and topographic Reflectivity of earth's surface and clouds in ultraviolet p 12 A87-32496 VIDEO DATA informations from satellite observations p 47 A87-40768 The topographic effect on Landsat data in gently Data Compression System for video images **UNDERWATER OPTICS** undulating terrain in southern Sweden p 4 A87-35307 Ocean optics VIII; Proceedings of the Meeting, Orlando. Wave-measurement capabilities of the surface contour VIDEO EQUIPMENT FL. Mar 31-Apr.2, 1986 Ground and aerial use of an infrared video camera with a mid-infrared filter (1.45 to 2.0 microns) radar and the airborne oceanographic lidar I SPIE-6371 p 28 A87-42637 p 25 A87-38840 UNITED STATES Feedback between ice flow, barotropic flow, and Continental land cover assessment using Landsat MSS baroclinic flow in the presence of bottom topography VIDEO SIGNALS p 3 A87-32095 p 27 A87-40289 Laser reflectance as a function of rough water glitter Spatial characterization of acid rain stress in Canadian Reports on cartography and geodesy, series 1, number profile Shield lakes AD-A1787741 NASA-CR-180992 ISSN-0469-42361 VIEW EFFECTS p 16 N87-22286 USER MANUALS (COMPUTER PROGRAMS) impact of radiance variations on satellite sensor Radar as a complement to topographic maps for Quick-look guide to the crustal dynamics project's data delineating marine terraces calibration nformation system PB87-154597 i INASA-TM-878181 p 1€ N87-23018 Large Format Camera photographs of the Black Hills. Detection of Rift Valley fever viral activity in Kenya by USER REQUIREMENTS USA and their suitability for topographic and thematic satellite remote sensing imagery European utilization aspects studies --- space stations p 55 N87-24792 VISIBLE INFRARED SPIN SCAN RADIOMETER mapping p 49 N87-20624 Simulations of the GOES visible sensor to changing surface and atmospheric conditions p.47. A87:40756 Radial orbit error reduction and sea surface topography Comparative evaluation and guide for the integrated determination using satellite altimetry utilization of LANDSAT (MSS and TM) and SPOT (HRV) VISIBLE SPECTRUM p 33 N87-24816 satellites remotely sensed data TOXIC HAZARDS Procedures for the description of agricultural crops and ETN-87-99356 p 41 N87-22278 Use of maps, aerial photographs, and other remote soils in optical and microwave remote sensing studies sensor data for practical evaluations of hazardous waste Optical dynamics experiment (ODEX) data report R:V SITES p 14 A87 42255 TRACERS acania expedition 10 October-17 November 1982. Jolume Particle size distributions Volume 6 Scalar Remotely-sensed tracers for hydrodynam VEGETABLES spectral-radiometer data estimation p 26 A87-39176 Identifying vegetable crops with Landsat Thematic TRACKING STATIONS

A87-35120

p 1 A8. 31411

p.6 A87 36579

Multipolarization SAR data for surface feature

Aerial and space investigations of soils and vegetation

delineation and forest vegetation character tation.

Russian book

VISUAL OBSERVATION

VISUAL PERCEPTION

AD-A178703

passive microwave sensor

Temporal observations of surface soil moisture using

The integration of spectral and spatial analysis for land

A-19

VOL	^-	-	FR

Synergistic use of MOMS-01 and Landsat TM data ---Modular Optoelectronic Multispectral Scanner

p 46 A87-39190 VORTICES

Ice-edge eddies in the Fram Strait marginal ice zone p 27 A87-40432

## WASTE DISPOSAL

Use of maps, aerial photographs, and other remote sensor data for practical evaluations of hazardous waste p 14 A87-42255 WATER

Laser reflectance as a function of rough water ditter

profile (AD-A178774) p 32 N87-23016

WATER BALANCE

Energy Balance of the Tropical Systems (BEST): A space p 36 N87-22373 experiment proposition WATER CIRCULATION

Long waves in the equatorial Atlantic Ocean during 1983 p 23 A87-37564 Remotely-sensed tracers for hydrodynamic surface flow p 26 A87-39176 estimation

WATER COLOR

The relationship between phytoplankton concentration and light attenuation in ocean waters p 29 A87-42642 Remote sensing of chlorophyll concentrations in the northern Gulf of Mexico p 29 A87-42643 Coastal zone color scanner imagery of phytoplankton

pigment distribution in Icelandic waters

p 29 A87-42645

WATER POLLUTION

Inland watland change detection using aircraft MSS data p 36 A87-42256 WATER QUALITY

Spatial characterization of acid rain stress in Canadian Shield lakes

(NASA-CR-180983) p 36 N87-24031 Spatial characterization of acid rain stress in Canadian Shield lakes

[NASA-CR-180982]

p 36 N87-24032

WATER VAPOR Balloon-borne infrared multichannel radiometer for

remote sensing of high resolution low-level water vapor p 43 A87-32477 WATER WAVES

Measurement of the spatial spectrum of ocean waves using a two-frequency scatterometer p 23 A87-36107 Measuring ocean waves from space; Proceedings of the Symposium, Johns Hopkins University, Laurel, MD, Apr. 15-17, 1986 p 24 A87-38826 The present status of operational wave forecasting ---

for ocean surface p 24 A87-38831 The operational performance of the fleet numerical oceanography center global spectral ocean-wave model

p 24 A87-38832 Recent results with a third-generation ocean-wave p 24 A87-38833 Some approaches for comparing remote and in-situ

estimates of directional wave spectra p 24 A87-38835 The microwave measurement of ocean-wave directional

spectra p 24 A87-38836 The physical basis for estimating wave-energy spectra with the radar ocean-wave spectrometer

p 25 A87-38839

Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar p 25 A87-38840

A practical methodology for estimating wave spectra om the SIR-B p 25 A87-38841

Spectrasat - A hybrid ROWS/SAR approach to monitor ocean waves from space

The Radar Ocean-Wave Spectromete p 25 A87-38846

A Spectrasat system design based on the Geosat experiment p 26 A87-38848

Airborne microwave Doppler measurements of ocean wave directional spectra p 26 A87-39180 Multilook images of ocean waves by synthetic aperture

radars p 28 A87-41068 Report of the workshop on Assimilation of Satellite Wind and Wave Data in Numerical Weather and Wave Prediction Models

[WCP-122] p 49 N87-21521 The SIR-B mission: Towards an understanding of internal

p 32 N87-23102 [ARF-TR-86122]

Ocean wind and wave model comparisons with GEOSAT (GEOdesy SATellite) satellite data

[AD-A178302]

p 33 N87-24061

### WATERSHEDS

A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p.9 A87-41428 p 9 A87-41428

WAVE PROPAGATION

Long waves in the equatorial Atlantic Ocean during p 23 A87-37564 The propagation of short surface waves on longer gravity aves p 28 A87-40835

WAVEFORMS

The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface p 26 A87-39179

## WEATHER

The impact of climate change from increased atmospheric carbon dioxide on American agricultur [DOE/NBB-0077] p 11 N87-23032

# WETLANDS

Remote sensing of coastal wetlands

D 9 A87-40944 Inland wetland change detection using aircraft MSS data p 36 A87-42256 Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies. Test site: Pantanal Region (Brazil/Paraguay) p 52 N87-24748

WILDLIFE

Habitat mapping by Landsat for aerial census of p 2 A87-32094 WIND (METEOROLOGY)

Ocean wind and wave model comparisons with GEOSAT (GEOdesy SATellite) satellite data [AD-A178302] p 33 N87-24061

WIND EFFECTS

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz

### WIND MEASUREMENT

Simulation of wind gradient errors in NROSS (Navy Remote Ocean Sensing System) radar scatterometer data in a simplified geometry

(AD-A175754) Report of the workshop on Assimilation of Satellite Wind and Wave Data in Numerical Weather and Wave Prediction

Models [WCP-122]

p 49 N87-21521 WIND SHEAR

Observations of intermittent cumulus convection in the p 20 A87-32976 boundary laver WIND VELOCITY

The 1982-1983 El Nino Atlas: Nimbus-7 microwave radiometer data [NASA-CR-180914] p 31 N87-22386

# WINDOWS (INTERVALS)

The AVHRR/HIRS operational method for satellite based sea surface temperature determination [NOAA-TR-NESDIS-28] p 31 N87-22388

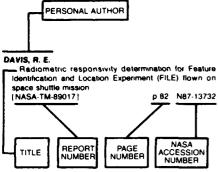
Nimbus 7 SMMR investigation of snowpack properties in the northern Great Plains for the winter of 1978-1979

D 34 A87-31409 Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newtoundland energy-active zone during winter p 31 N87-21980

# Z

Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers INASA-TP-26431 p 49 N87-22281

# **Typical Personal Author** Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

# AARTMAN, L. J.

A modular and versatile acquisition, recording and preprocessing system for airborne remote sensing p 52 N87-24751

# ABSHIRE, JAMES B.

Two-color short-pulse laser altimeter measurements of p 27 A87-39462 ocean surface backscatter

# ACHUTUNI, R.

A review of national and international activities on modeling the effects of increased CO2 concentrations on the simulation of regional crop production: A report on linkage between climate and crop models IDE87-0059941 p 10 N87-22336

# **ACHUTUNI, RAO**

The impact of climate change from increased atmospheric carbon dioxide on American agriculture IDOE/NBB-00771 o 11 N87-23032

# ACKERMANN, FRIEDRICH

Improvement of image quality by forward motion compensation, a preliminary report p 42 N87-24741 The use of camera orientation data in photogrammetry p 52 N87-24749 A review

# ADAMS, STEVEN

An assessment of Landsat MSS and TM data for urban and near-urban land-cover digital classification

# n 13 A87-37280

# ADIGA, S.

Indian remote sensing programme p 56 A87-32955 AGREEN, RUSSELL

### The Geosat altimeter mission - A milestone in satellite oceanography p 27 A87-40281

# AHMAD, SURAIYA P.

Computation of diffuse sky irradiance from multidirectional radiance measurements p 6 A87-37279

# AL-HINAI, KHATTAB G.

Landsat image enhancement study of possible submerged sand-dunes in the Arabian Gulf p 22 A87-35315

# ALBERTZ, JOERG

acquisition Digital data tor close-ranne p 54 N87-24785 photogrammetry

### ALI, ABDALLA ELSADIG

Optical and digital SAR processing techniques: A statistical comparison of accuracy using SEASAT imagery p 42 N87-24753

## ALLAN, T. D.

Ocean-ice panel report p 30 N87-20635 ALLEN, L. H., JR.

Comparison of HCMM and GOES satellite temperature and evaluation of surface statistics p 39 A87-38098 ALLUM, J. A. E.

Remote sensing of vegetation change near Inco's Sudbury mining complexes p.8 A87-39185

AMAYENC, P. Energy Balance of the Tropical Systems (BEST): A space

p 36 N87-22373 experiment proposition AMBROZIAK, RUSSELL ANDREW

Real-time crop assessment using color theory and p 10 N87-20619 satellite data

ANDERSON, VIRGIL Continental land cover assessment using Landsat MSS data p 3 A87-32095

ANDHARIA, H. I. Determination of the velocity of ocean gyres through

p 22 A87-35314 Synthetic Aperture Radar ANNONI, ALESSANDRO

Comparative evaluation and guide for the integrated utilization of LANDSAT (MSS and TM) and SPOT (HRV) satellites remotely sensed data (ETN-87-99356) p 41 N87-22278

## APARINOVA, N. A.

Statistical evaluation of forest characteristics from aerial and space photographs ARKOS, FERENCZ p 5 A87-36109

## Remote sensing methods of yield forecasting

p 2 A87-32009

# ARMAND, M.

Towards an automatic identification of urban textures p 14 N87-24747

# ARMAND, MYRIAM

Reconnaissance of vegetal formations in a Guinean forest sector by means of Landsat images p 6 A87-36946

# ARSENAULT, L. D.

Microwave sea-ice signatures near the onset of melt p 22 A87-35517

# **ASANUMA, ICHIO**

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz p 22 A87-35515

# ASHKENAZI, VIDAL

GINFEST - Geodetic intercomparison network for p 15 A87-36164 evaluating space techniques ATKINSON, L. P.

Continental shelf processes affecting the oceanography of the South Atlantic Bight

p 30 N87-20716 DE87-0053031

# AUSTIN. G. L.

On the relative accuracy of satellite and raingage rainfall measurements over middle latitudes during daylight p 34 A87-33295 hours

# AUSTIN JOHN

Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence on microwave communications planning and rain-rate data p 46 A87-36933

# **AUVINE, BRIAN**

Quick look Atlantic Ocean rain maps for gale INASA-CR-180511) p 30 N87-21533

# AZUMA, YOSHIO

Airborne observation experiments for MOS-1 verification program (MVP) p 44 A87-32500

# В

# BADHWAR, G. D.

Landsat classification of Argentina summer crops p 3 A87-32098

# BADHWAR, GAUTAM D.

Signature-extendable technology - Global space-based crop recognition p 1 A87-31414

## BAGG, M. T.

The SIR-B mission: Towards an understanding of internal waves in the ocean p 32 N87-23102

[ARE-TR-86122] BAILEY, CHARLES L.

Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A87-37827

## BAKER, WAYMAN E.

Impact of satellite-based data on FGGE general p 44 A87-32985 circulation statistics

## BARAT, J.

Energy Balance of the Tropical Systems (BEST): A space p 36 N87-22373 experiment proposition

# BARDINET, C.

Image preprocessing for line detection based on local structure analysis p 39 A87-37801

### p 39 A87-37803 Multisatellite data processing BARKER, J. L.

Thematic Mapper bandpass solar exoatmospheric p 40 A87-39192

# BASKARAN, M.

Geochronological studies of strandlines of Saurashtra, India, detected by remote sensing techniques p 15 A87-35308

### BATES, JOHN JOSEPH

A technique to estimate the ocean surface energy flux using VAS multispectral data p 30 N87-20710

BATTRICK, B. Proceedings of the European Symposium on Polar

platform Opportunities and Remote-Sensing (ESPOIR) instrumentation

[ESA-SP-266] Proceedings of the International Symposium on Progress

in Imaging Sensors [ESA-SP-252] p 50 N87-24738

# BAUERSIMA, I

Using the Global Positioning System (GPS) for high precision geodetic surveys - Highlights and problem p 16 A87-41383

# BAUMANN, ROBERT H.

Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent

INASA-CR-1809841 p.33 N87-24012

# BAUMER, GEORGE M.

High resolution remote sensing of spatially and spectrally complex coal surface mines of central Pennsylvania - A comparison between simulated SPOT MSS and Landsat-5 p 18 A87-39468

# BAUMGARDNER, M. F.

Remote sensing research in global agricultural p 2 A87-32008

# BAUMGARDNER, R. W.

LANDSAT-based lineament analysis, East Texas Basin, and structural history of the Sabine Uplift area, East Texas and North Louisiana IPB87-176327 p 19 N87-24043

# BEAL, ROBERT C.

Measuring ocean waves from space; Proceedings of the Symposium, Johns Hopkins University, Laurel, MD, Apr. p 24 A87-38826 15-17, 1986 Spectrasat - A hybrid ROWS/SAR approach to monitor p 25 A87-38845

### ocean waves from space BECK SHERWIN M

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 BECKER, ROLF

# Very high resolution aerial films

p 54 N87-24776 **BECKOW, STEPHEN** p 38 A87-36361 Mapping from space

Radiometric correction of SAR images - A new correction p 40 A87-39184 algorithm

SPOT image quality **BEHNKE, JEANNE M.** p 42 N87-24804 Quick-look guide to the crustal dynamics project's data

information s [NASA-TM-87818] p 16 N87-23018 BELIAEV, M. IU.

Optimization of a program of experiments in connection with the operational planning of studies carried out with p 56 A87-34208 a spacecraft

BELLON, A.

On the relative accuracy of satellite and raingage rainfall measurements over middle latitudes during daylight n 34 A87-33295 hours

BELWARD, A. S.

A comparison of supervised maximum likelihood and decision tree classification for crop cover estimation from nultitemporal Landsat MSS data p 5 A87-35312

BENDURA RICHARD J

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 BENTLEY, CHARLES R.

West Antarctic ice streams draining into the Ross ice Shelf Configuration and mass balance

n 19 A87-31592

p 36 N87-22373

BERNARD, R.

Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298

Nadir looking airborne radar and possible applications p 7 A87-38095 Energy Balance of the Tropical Systems (BEST): A space

experiment proposition BEUTLER G.

Using the Global Positioning System (GPS) for high precision geodetic surveys - Highlights and proble p 16 A87-41383 areas

BHARTIA, P. K.

Reflectivity of earth's surface and clouds in ultraviolet p 47 A87-40768 from satellite observations

BINNIE, DOUGLAS R.

The Denali image map р 38 А87-37288

BISWAS R R

A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou p 9 A87-41428 districts of Bihar, India

BLAZQUEZ, C. H.

Ground and aerial use of an infrared video camera with a mid-infrared filter (1.45 to 2.0 microns)

p 48 A87-41588

BLECHINGER, F.
Advanced imaging spectrometer for ocean p 33 N87-24766

RUZARD MARVIN A

Ocean optics VIII; Proceedings of the Meeting, Orlando, FL, Mar. 31-Apr.2, 1986 p 28 A87-42637 LSPIE-6371

BLUSSON ANNICK

Spacelab data - A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790

**BOBERG, ANDERS E.** 

Image quality problems in practical aerial photography p 43 N87-24814

BODECHTEL, J.

p 49 N87-20634 Land panel report The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuer Forschung und Technologie (BMFT). Milestones in the development of an operational Earth Observation p 55 N87-24815 system

BOERNER, WOLFGANG-M.

Interpretation of the polarimetric co-polarization phase term in radar images obtained with the JPL airborne L-band SAR system p 36 A87-31412

BOISSIN, B.

SPOT image quality p 42 N87-24804

BOLSHAKOV, A. N.

Cloud-cover and precipitation patterns over the Republic of Guinea according to ground-based and satellite p 35 A87-36102

**BONN, FERDINAND** 

Radiometric correction of SAR images - A new correction algorithm p 40 A87-39184

BOTKIN, D. B.

New dimension analyses with error analysis for quaking asoen and black spruce [NASA-TM-89219] n 11 N87-24735

BOTKIN, DANIEL B.

Earth science research

p 11 N87-24733 INASA-CR-1805121 Ten year change in forest succession and composition

measured by remote sensing INASA-CR-1809481 p 11 N87-24736

BOUR, WILLIAM

Coral reef remote sensing applications

n 20 A87-32951

BOURNE, CARLTON M.

Laser reflectance as a function of rough water glitter

p 32 N87-23016 IAD-A1787741

BOWELL, J. A.

Enhanced LANDSAT images of Antarctica and planetary p 50 N87-23558

The application of remote sensing in agricultural meteorology at the Meteorological Service of the HPR p 2 A87-32010

BRACHET, G.

Remote sensing applications: Commercial issues and p 57 N87-20626 opportunities for space station

BRADSHAW, J. D.

Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432

**BRAUN, HANS MARTIN** 

The first ESA remote sensing satellite (status and p 57 N87-24777 outlook)

BREST, CHRISTOPHER L.

Deriving surface albedo measurements from narrow

VHF radar for ocean surface current and sea state p 19 A87-31631 remote sensing

BROCHU, RICHARD Radiometric comparison of the Landsat-5 TM and MSS p 47 A87-41432 sensors

BROCKHAUS, JOHN A.

Comparison of Landsat MSS and TM data for urban land-use classification p 13 A87-35523

Ocean wind and wave model comparisons with GEOSAT (GEOdesv SATellite) satellite data p 33 N87-24061 [AD-A178302]

BROSSIER, R.

Applications of laser airborne telemetry at Institut Geographique National (IGN), France

p 53 N87-24761

p 33 N87-24012

p 13 A87-37280

Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries

[NASA-CR-180984]

BROWELL, EDWARD Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196

BROWN, WILLIE A.

DUCK '85 nearshore waves and currents experiment data summary report p 31 N87-22382 IAD-A1774191

BRUEMMER, BURGHARD

Observations of intermittent cumulus convection in the boundary layer p 20 A87-32976

BRYANT, NEVIN

An assessment of Landsat MSS and TM data for urban and near-urban land-cover digital classification

BUDKO, V. M.

The geostructural characteristics of the rift zone on the Lambert glacier (Antarctica) according to space image

BUKHMAN, E. V.

Rapid analysis of satellite radar images of sea ice p 22 A87-35873

BULATOV, M. G.

Measurement of the spatial spectrum of ocean waves using a two-frequency scatterometer p 23 A87-36107

Foundations and applications of multispectral scanning

in agriculture p 10 N87-21408 [NLR-MP-85015-U]

BUNTING, JAMES T.

Atmospheric remote sensing in arctic regions (AD-A179550) p 50 N87-23012

BURGUENO, AUGUST

Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence on microwave communications planning and rain-rate data p 46 A87-36933

BURLESHIN, M. I.

The geometry of the intersections of tectonic structures detected on satellite images p 17 A87-36104 BURNS, B. A.

Remote sensing of the Fram Strait marginal ice zone p 27 A87-40433

BURNS, D. A.

Ocean wind and wave model comparisons with GEOSAT (GEOdesy SATellite) satellite data p 33 N87-24061 LAD-A1783021

BUSH, PETER R.

Landsat image enhancement study of possible ubmerged sand-dunes in the Arabian Gulf

p 22 A87-35315

NASA/MSFC large stretch press study p 41 N87-20554 INASA-CR-1803761

CAI, JUNLIANG

On the matching of resolution in aerial photographic p 54 N87-24773 systems

CAMPBELL, CHARLES

Polarized views of the earth from orbital altitude p 48 A87-42639

CAMPBELL, N. A.

Some observations on crop profile modelling

p 5 A87-35310

CAMPBELL, W. J. ice-edge eddies in the Fram Strait marginal ice zone p 27 A87 40432

Remote sensing of the Fram Strait marginal ice zone p 27 A87-40433

CAMPBELL, WILLIAM J.

Arctic Sea ice, 1973-1976: Satellite passive-microwave observations

INASA-SP-4891 p 33 N87-24870

CARDER, KENDALL L.

The interaction of light with phytoplankton in the marine environment p 29 A87-42640

CARDONE, VINCENT J.

The present status of operational wave forecasting p 24 A87-38831

CARLSON, T.

Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298

CARROLL, M. A.

Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431

CARSEY, F. D.

Remote sensing as a research tool

p 28 A87-40648

CASE, DAVID Continental land cover assessment using Landsat MSS

data p 3 A87-32095 CASTELLANI, ANTONIO

Balloon-borne infrared multichannel radiometer for remote sensing of high resolution low-level water vapor p 43 A87-32477 fields

CAVALIERI, DONALD J.

Arctic Sea ice, 1973-1976: Satellite passive-microwave observations

INASA-SP-4891 p 33 N87-24870

CHALLENOR, P. G.

The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface p 26 A87-39179

CHANG, A. T. C.

Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Souther Great Plains p 5 A87-35309

CHANG JY-TAI

Concerning the relationship between evapotranspiration p8 A87-40244 and soil moisture

CHAO, TIEN-HSIN

Optical image subtraction techniques, 1975-1985 p 40 A87-42659

CHAPLET, MICHEL

Fault patterns by space remote sensing and the rotation of western Oregon during Cenozoic times p 18 A87-36525

CHARBONNEAU, LISE Radiometric companson of the Landsat-5 TM and MSS sensors p 47 A87-41432

Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p 39 A87-38098

CHEN, HUIPING On the matching of resolution in aerial photographic systems p 54 N87-24773

CHEN. WEIYING

CHEN E

High resolution sea surface temperature field derive p 33 N87-24731

CHENEY, ROBERT

The Geosat altimeter mission. A milestone in satellite oceanography p 27 A87-40281

CHESHIRE, HEATHER M. Companson of Landsat MSS and TM data for urban

land-use classification p 13 A87-35523

PERSONA
CHMIKARA, F Error and allometric re [NASA-TM- CHIMOT, J. M Aircraft ra hydrographic CHOATE, M. I NASA-/MS [NASA-CC CHOROWICZ Fault patts of western (
CHOUDHURY Monsoor assessment data CHOUDHURY Quantifyin microwave t Great Plains Monitorin mutichannel
CHRISTENSE inland we data CIHLAR, J. Procedure soils in optic
CLARK, DENI Coastal zo pigment dist
CLARK, H. LA The interia environment CLARK, THOI Creation VLBI CLEVERS, J. Determina growth from photography CLEVERS, JA An applica to agricultura COLLINS, DO The interia environment A model fi measurement
COLVOCORE: The Dena COMISO, J. C Recurring Maud Rise COMISO, J.OS Arctic Sea observations [NASA-SP-4 CONDON, ES Operation instrument oxide, and h Carbon m Pacific durin
CORNILLON, Satellite in hurricane Gl
COULSON, KI Polarized

alvsis of leaf area estimates made from egression models 892201 diopositioning for airborne photography during c coastal surveys SFC large stretch press study 180376 **JEAN** erns by space remote sensing and the rotation Dregon during Cenozoic times A. M. flood boundary delineation and damage using space borne imaging radar and Landsat ng spatial and temporal variabilities of rightness temperature over the U.S. Southern vegetation using Nimbus-7 scanning microwave radiometer's data N, ERIC J. etland change detection using aircraft MSS es for the description of agricultural crops and cal and microwave remote sensing studies p.8 A87-39187 NIS K one color scanner imagery of phytoplankton tribution in Icelandic waters WRENCE action of light with phytoplankton in the marine of a global geodetic network using Mark III calibrated multispectral small format aerial ation of low altitude multispectral photography al field thals NALD J. iction of light with phytoplankton in the marine or the use of satellite remote sensing for the nt of primary production in the ocean SSES, ALDEN P. li image map polynyas over the Cosmonaut Sea and the ice, 1973-1976: Satellite passive-microwave TELLE P. al overview of NASA GTE/CITE 1 airborne intercomparisons - Carbon monoxide, nitric vdroxyl instrumentation p 45 A87-33426 nonoxide measurements over the eastern g GTE/CITE 1 PETER neasurements of sea surface cooling during

NSELL L. views of the earth from orbital altitude

CRACKNELL, A. P.

p 48 A87-42639 A two-look technique for studying atmospheric effects in optical scanner data for the ocean p 26 A87-39178

CRAUBNER, SIEGFRIED Infrared Earth horizon sensor concepts in various

p 52 N87-24752 spectral bands CRIPPEN, ROBERT E.

The regression intersection method of adjusting image p 45 A87 35306 data for band ratioing CROCHET, M.

VHF radar for ocean surface current and sea state remote sensing p 19 A87-31631 CROTEAU, J. C.

Spectrophotometric measurements on color aerial photographs p 55 N87-24798 CUBASCH, ULRICH

The impact of initial conditions and SST Anomalies on extended range predictions for the El Nino period p 32 N87-23046 CURFMAN, HOWARD J., JR.

p 11 N87-24010

p 23 A87-36945

p 41 N87-20554

p 18 A87-36525

p 35 A87-39467

o 5 A87-35309

p8 A87-39194

p 36 A87-42256

p 29 A87-42645

p 29 A87-42640

p 15 A87-36166

p 12 N87-24801

p 6 A87-37054

p 29 A87-42640

p 29 A87-42644

p 38 A87-37288

p 23 A87-37563

p 33 N87-24870

p 21 A87-33435

p 24 A87-37886

of spectral reflectance of crops during

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 CURLANDER, JOHN C.

Rectification of terrain induced distortions in radar p 48 A87-42254 Radiometric calibration of the Shuttle Imaging Radar p 53 N87-24756 (SIR-C) system CURRAN, P. J.

GLAI estimation using measurements of red near infrared, and middle infrared radiance p 4 A87-35119 A polar platform for the remote sensing needs of ecology and agriculture - A view from the U.K. p.9 A87-41430 CZAPLEWSKI, RAYMOND L.

Comparison between digital and manual interpretation of high altitude aerial photographs p 48 A87-42257

DALU, G. Remotely sensed sea surface temperature for the Alpine p 30 N87-21497 DANDJINOU, TOUNDE

First results of lateritic cover mapping with SPOT images The Kangaba region (South-Mali) p 18 A87-36925 DANIELSEN, EDWIN F.

Carbon monoxide measurements over the eastern Pacific during GTE/CITE 1 p 21 A87-33435 DAUGHTRY, C. S. T.

Remote sensing research in global agricultural roductivity p.2 A87-32008 Variations in the polarized leaf reflectance of Sorghum p 7 A87-38097 DAVIDSON, J. M.

GPS-based geodesy in California, Mexico and the Caribbean p 16 A87-41380 DAVIDSON, K. L.

Optical properties of the marine atmospheric boundary layer - Aerosol profiles p 28 A87-42638 DAVIES, F. GLYN

Detection of Rift Valley fever viral activity in Kenya by p 7 A87-37827 satellite remote sensing imagery DAVIS, D. D.

Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432 DAVIS, L. I., JR.

OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430 DAY, RICHARD

Tectonic evaluation of the Nubian Shield of northeastern Sudan using Thematic Mapper imagery [NASA-CR-180575] p 19 N87-22319

Some observations on crop profile modelling

p 5 A87-35310

DE HOYOS, A. A comparison of supervised maximum likelihood and decision tree classification for crop cover estimation from multitemporal Landsat MSS data p 5 A87-35312

DE KOOMEN, J. H. The Ne'herlands-Indonesian remote-sensing satellite p 43 A87-32210 **TERS** 

DE MAISTRE, J. C. VHF radar for ocean surface current and sea state remote sensing p 19 A87-31631 DECKER, W. L.

A review of national and international activities on modeling the effects of increased CO2 concentrations on the simulation of regional crop production: A report on linkage between climate and crop models IDE87-0059941 p 10 N87-22336

DECKER, WAYNE L. The impact of climate change from increased atmospheric carbon dioxide on American agriculture 1DOE/NBB-00771 p 11 N87-23032

ellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data D 47 A87-40246

DEEKSHATULU, B. L. Indian remote sensing programme p 56 A87-32955 DEERING, DONALD W.

Computation of diffuse sky irradiance from multidirectional radiance measurements p 6 A87-37279

**DELLA VENTURA, ANNA** Development of a satellite remote sensing technique for the study of alpine glaciers p 34 A87-35311 DESBOIS, MICHEL

Measurement and detection of precipitation. Satellite methods in the visible and the infrared

p.36 N87-22364

DESCHAMPS, P. Y.

Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data A87-40246

DEVENON, J. L.

VHF radar for ocean surface current and sea state p 19 A87-31631 remote sensing

DI RUSCIO, MAURIZIO

Balloon-borne infrared multichannel radiometer for remote sensing of high resolution low-level water vapor fields p 43 A87-32477

DIETRICH, R.

investigation of tectonic deformations using global p 14 A87-33375 satellite laser ranging data DIETZ, KLAUR R.

Large Format Camera photographs of the Black Hills. USA, and their suitability for topographic and thematic mapping p 55 N87-24792

DIXON, T. H.

GPS-based geodesy in California, Mexico and the Caribbean p 16 A87-41380

DOBSON, M. C.

Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies p8 A87-39187

DOBSON, MYRON C.

Relating polarization phase difference of SAR signals p 1 A87-31413 to scene properties

DOEOES, B. R. The observational objectives and the implementation

of the Global Weather Experiment p 49 N87-21474 DOLLHOPF, KEVIN J. An evaluation of satellite-based insolation estimates for

Ohio p 34 A87-33297 DONEAUD, ANDRE A.

The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data . A preliminary investigation p 35 A87-40249

DOROFEEV. V. L. Use of satellite altimetry for ocean monitoring

p 23 A87-36101 DOUGLAS, BRUCE The Geosat altimeter mission - A milestone in satellite

p 27 A87-40281 DOZIER, JEFF

Recent research in snow hydrology p 35 A87-40309

DREISINGER, B. R. Remote sensing of vegetation change near inco's Sudbury mining complexes p 8 A87-39185

DRESCHER, A. Stereoscopic line scan imaging and satellite control

p 38 A87-36757 DGLR PAPER 86-1061 DUDA, C. Exposure test with high resolution films from high

p 54 N87-24775 altitude DUGGIN, MICHAEL J.

impact of radiance variations on satellite sensor calibration p 47 A87-39457 DYE. DENNIS

Comparison of North and South American biomes from p 9 A87-403G2 AVHRR observations DZIEWONSKI, ADAM M.

Global images of the earth's interior

p 15 A87-37918

E

EBERHARDT, JOHN E.

Mid-infrared remote sensing systems and their p 17 A87-35522 application to lithologic mapping

Reflectivity of earth's surface and clouds in ultraviolet from satellite observations p 47 A87-40768 EDWARDS, A. C.

The SIR-B mission: Towards an understanding of internal waves in the ocean

ARE-TR-861221 p 32 N87-23102 EDWARDS, K.

Enhanced LANDSAT images of Antarctica and planetary p 50 N87-23558

FHLERS MANERED Merging multiresolution SPOT HRV and Landsat TM

p 38 A87-37287 EL-SAYED, SAYED Z.

Remote sensing of chlorophyll concentrations in the orthern Gulf of Mexico p 29 A87-42643 p 29 A87-42643

**ELACHI, CHARLES** Spaceborne imaging radar research in the 1990s - An

p 46 A87-38837 Earth surface sensing in the '90's p 51 N87-24739 ELIASON, E. M.

Enhanced LANDSAT images of Antarctica and planetary p 50 N87-23558 exploration

FI MAN R I

Statistical evaluation of forest characteristics from aerial and space photographs p 5 A87 36109 FMFRY W .I

Comparison of satellite derived sea surface temperatures with in situ skin measurements

ENGELIS, THEODOSSIOS

Radial orbit error reduction and sea surface topography determination using satellite altimetry

[NASA-CR 180570] p. 33 N87 24816 FOM: HYO J.

Interpretation of the polarimetric co-polarization phase term in radar images obtained with the JPL airborne L-band p 36 A87 31412 SAR system ERMOLAEV, A. G.

Physical principles of image convergence in remote p 40 A87-41925 sensino

ESCOBAR, D. E. Ground and aerial use of an infrared video camera with

p 48 A87-41588

p 23 A87-37565

ESTES, JOHN E. Remote Sensing Information Sciences Research Group Santa Barbara Information Sciences Research Group, year

a mid-infrared filter (1.45 to 2.0 microns)

[NASA-CR-181073] ETKIN, V. S.

n 43 N87-24817

Measurement of the spatial spectrum of ocean waves using a two-frequency scatterometer p.23. A87-36107 EVERITT, J. H.

Ground and aerial use of an infrared video camera with a mid-infrared filter (1.45 to 2.0 microns)

EWING, J. A. Simulations of the GOES visible sensor to changing surface and atmospheric conditions p 47 A87-40756 FYMARD L.

Energy Balance of the Tropical Systems (BEST). A space experiment proposition

FAGBAMI, AYODELE

Reflectance characteristics and its application in the classification of Nigerian Savanna soils

n.3 A87-32954

FAGERLUND, ERIK Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090

FAIRALL C.W. Optical properties of the marine atmospheric boundary

layer - Aerosol profiles p 28 A87 42638

FEDCHENKO, PETR PETROVICH Aerial and space investigations of soils and vegetation p 6 A87-36579

FEDOTOV. A. B.

Use of satellite altimetry for ocean monitoring

p 23 A87-36101

FEIVESON, A. H. Error analysis of leaf area estimates made from flometric regression models p 11 N87-24010

NASA-TM-892201 New dimension analyses with error analysis for quaking aspen and black spruce

INASA-TM-892191 p 11 N87-24735

FEIZULLAEV, A. A.

The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources

FELDE, GERALD W.

Atmospheric remote sensing in arctic regions p 50 N87-23012 IAD-A1795501

**FELLOUS, JEAN-LOUIS** 

The French Space Oceanography Program

p 20 A87-32503

FERENCZ ARKOS. I. Surface models including direct cross radiation simple model of furrowed surfaces p 40 A87-39189 FERENCZ, CS.

Remote sensing methods of yield forecasting

p 2 A87-32009

Surface models including direct cross-radiation - A p 40 A87-39189 simple model of furrowed surfaces

FERGUSON, H. M.

Enhanced LANDSAT images of Antarctica and planetary exploration p 50 N87-23558

FIELD, R. T.

Measurement of the surface emissivity of turbid p 19 A87 32097 waters

FISHMAN, JACK

OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430 FLAMANT P

Energy Balance of the Tropical Systems (BEST). A space experiment proposition

FOO, BING-YUEN

interpretation of the polarimetric co-polarization phase term in radar images obtained with the JPL airborne L band SAR system

FORGET, P. VHF radar for ocean surface current and sea state remote sensina p 19 A87 31631

FORSBERG, RENE

A new covariance model for inertial gravimetry and oradiometry p 14 A87-31591

FRAIN WILLIAM E.

A Spectrasat system design based on the Geosat p 26 A87 38848

FRANCIS, PETER W.

Synergistic use of MOMS-01 and Landsat TM data p 46 A87-39190 FRASER, S. J.

A software defoliant for geological analysis of band p 18 A87-39193 ratios

FREYSSINET, PHILIPPE

First results of lateritic cover mapping with SPOT images The Kangaba region (South-Mali) p 18 A87-36925

FREZAL, M. E.

Nadir looking airborne radar and possible applications p 7 A87-38095 to forestry

FRIESS, PETER

The effects of camera position and attitude data in aerial triangulation, a simulation study p 52 N87-24750 FUJITA, MASAHARU

Observation of precipitation from space by the weather p 44 A87-32507 FUKUE, KIYONARI

approach

Global vegetation monitoring using NOAA vegetation lex data p 3 A87-32495 FUSCO, L. AVHHR data services in Europe - The Earthnet

p 39 A87-37922

G

GADZHIR-ZADE, F. M.

The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution characteristics of its sources p 13 A87-36125

GAFOOR, A.

Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsat p 35 A87-39467 data

GALLAGHER, JOHN G.

The relation of millimeter-wavelength backscatter to p 34 A87 35518 surface snow properties

GANTT R G

Measurement of the surface emissivity of turbid p 19 A87 32097

GARGANTINI, C. E.

Landsat classification of Argentina summer crops p 3 A87-32098

GARSTANG, MICHAEL

Trace gas exchanges and transports over p 12 A87-32196 Amazonian rain forest GASCARD J. C.

Mesoscale oceanographic processes beneath the ice of Fram Strait p 28 A87-40434

GAUTHIER, R. P.

The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager. Four years of operation p 53 N87-24767

GENDT, G.

Investigation of tectonic deformations using global satellite laser ranging data p 14 A87-33375

GERSTL, S. A. W.

An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of validity

|DE87-006059|

Modelling of atmospheric effects on the angular distribution of a backscattering peak [DE87-006060] p 41 N87-24014

GIBSON, J. R.

The use of auxiliary date in photogrammetric GIERLOFF-EMDEN, H.-G.

Large format camera image analysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plair p 55 N87-24789 North Italy

GLOERSEN, PER

Arctic Sea ice, 1973-1976 Satellite passive-microwave observations

INASA-SP-4891 p 33 N87-24870 GOEL NARENDRAS

Estimation of canopy parameters of row planted vegetation cariopies using reflectance data for or view directions p.2 A87 32093 Inversion of canopy reflectance models for estimation

of vegetation parameters. INASA CR-1810591

GOETZ SCOTT J.

p.12 N87-24737

Ten year change in forest succession and composition

measured by remote sensing INASA-CR-1809481

p.11 N87-24736

GOLDBERG, MICHAEL J.

Problems in merging Earth sensing satellite data sets p 50 N87 22457

GOLUS, R. E.

Quantifying spatial and temporal variabilities of microwave bilightness temperature over the U.S. Southern p.5 A87 35309 Great Plains Monitoring vegetation using Nimbus-7 scanning mutichannel microwave radiometer's data

p.8 A87 39194

GOMBERG, LOUIS

United States remote sensing satellites (RSSs) past. p 56 A87 32502 present, and future

GONZALEZ, FRANK I.

The age and source of ocean swell observed in p 25 A87 38843 Hurricane Josephine

GORDON, A. L.

Recurring polynyas over the Cosmonaut Sea and the Maud Rise p 23 A87 37563

GOSSELINK, JAMES G.

Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine dependent fisheries

INASA-CR-1809841 p 33 N87-24012

GOWARD, S. N.

Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern p 5 A87-35309

GOWARD, SAMUEL N.

Deriving surface albedo measurements from narrow band satellite data p 13 A87-39182 Comparison of North and South American biomes from

AVHRR observations GRANT, LOIS

Variations in the polarized leaf reflectance of Sorghum p 7 A87-38097 bicolor

GRASSL, H.

Comparison of satellite-derived sea surface temperatures with in situ skin measurements

p 9 A87-40303

GRATZKI, A.

An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of p 41 N87-24011

LDE87-006059!

GRAY, A. LAURENCE Seasonal and regional variations of active/passive microwave signatures of sea ice p 22 A87-35516 Microwave so since rignatures near the onset of melt p 22 A87-35517

GRECO, B. The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface p 26 A87-39179

GREEN, A. A.

GRECO, STEVE Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 p 12 A87-32196

A software defoliant for geological analysis of band ratios

GREEN, ANDREW A. Mid-infrared remote sensing systems and their application to lithologic mapping p 17 A87-35522

GREGORY, G. L.

Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431

p 18 A87-39193

GREGORY, GERALD L.

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons. Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426

**GRIER, TOBY** Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four p 2 A87-32093

GRIFFITH, DOUGLAS M.

A comparison of optical bar, high-altitude, and black-and-white photography in land classification p 4 A87-35122

GROSS, M. F.

Remote sensing of coastal wetlands

p 9 A87-40944

PERSONAL
GROVES, J. E. Statistical of the Chukchis (DE87-00105 GUENTHER, G. Wind and 'surface' reture GULIEV, I. S. The possis methane in the characteristic GUO, CHUAN OH measure zone in the P GURTNER, W. Using the precision geometers of geometers of geometers of the precision geometers of the preci
HAACK, BARR An assessn and near-urbs
HAKKINEN, SII Feedback baroclinic flow
HALL-KONYVE The topogrundulating ter HALL, FORRES Signature-e crop recognit Ten year ci measured by [NASA-CR-16 HALLIKAINEN, Applications Finland HAMAR, D. Remote ser
Surface m simple model <b>HANCOCK, DA</b> Wave-meas radar and the
HANDY, J. R. Spectropho photographs HARADA, YOS Earth reso. HARDER, PAUI Nimbus 7 S in the norther HARDISKY, M.
HARDY, KENNI Atmospheri [AD-A179550 HARLOW, CHA The integra use classifica [AD-A178703

description of the summertime ice edge in 61 ARY C nadir angle effects on airborne lidar water bility of using satellite measurements of e atmosphere to study the global-distribution rement near the intertropical convergence Global Positioning System (GPS) for high detic surveys - Highlights and problem ng airborne radar and possible applications p 7 A87-38095 c correction of SAR images - A new correction ment of Landsat MSS and TM data for urban an land-cover digital classification between ice flow, barotropic flow, and w in the presence of bottom topography S. KARIN raphic effect on Landsat data in gently rrain in southern Sweden p 4 A87-35307 extendable technology - Global space-based ion p 1 A87-31414 hange in forest succession and composition remote sensing 10948 MARTTI T. is of satellite microwave radiometry in nsing methods of yield forecasting nodels including direct cross-radiation - A of furrowed surfaces surement capabilities of the surface contour airborne oceanographic lidar stometric measurements on color aerial HIHIRO urces satellite-1 (ERS-1) p 44 A87-32501

SMMR investigation of snowpack properties n Great Plains for the winter of 1978-1979 nsing of coastal wetlands

ETH R.

ic remote sensing in arctic regions

p 50 N87-23012 RLES A. ition of spectral and spatial analysis for land

p 14 N87-23015 HARNISH, DAVID

Tectonic evaluation of the Nubian Shield of northeastern Sudan using Thematic Mapper imagery NASA-CR-180575] p 19 N87-22319

HARRIS, JEFF Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p 17 A87-31410 HARRISS, ROBERT

Trace gas exchanges and transports over the p 12 A87-32196 Amazonian rain forest HARTL PH.

Smart sensors: An overview and selected examples p 51 N87-24740 Application of Global Positioning System (GPS) p 53 N87-24763 receivers for Earth observation HAUB, JOHN G.

Mid-infrared remote sensing systems and their pplication to lithologic mapping p 17 A87-35522 application to lithologic mapping

HAUCK, MARTIN

p 31 N87-22387

p 29 A87-42641

p 13 A87-36125

p 21 A87-33430

p 16 A87-41383

p 40 A87-39184

p 13 A87-37280

p 27 A87-40289

p 11 N87-24736

p 44 A87-32952

p 2 A87-32009

p 40 A87-39189

p 25 A87-38840

p 55 N87-24798

p 34 A87-31409

p 9 A87-40944

Н

Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies. Test site: Pantanal Region (Brazil/Paraguay) p 52 N87-24748

HE, DONG-CHEN

Automatic classification of Pointe d'Arcay landscapes using Thematic Mapper data with the aid of a textural p 37 A87-35305 Introduction of initial centers for the algorithm of p 37 A87-35313 clustering around mobile centers

Relating polarization phase difference of SAR signals p 1 A87-31413 to scene properties HENDERSON, FLOYD M.

Polarization, land use type and intraurban location as variables in SAR mapping accuracy p 12 A87-32953 Urban land use separability as a function of radai polarization p 14 A87-39188

Towards an automatic identification of urban textures p 14 N87-24747

HIBLER, W. D., III An evaluation of the polar ice prediction system (AD-A178522) p 41 N87-23014

Some observations on crop profile modelling p 5 A87-35310

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation

p 45 A87-33426 Carbon monoxide measurements over the eastern Pacific during GTE/CITE 1 p 21 A87-33435 HILL GREG J. E. Habitat mapping by Landsat for aerial census of

p 2 A87-32094 HILLER, KONRAD

Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies. Test site: Pantanal Region (Brazil/Paraguay)

p 52 N87-24748 HINES, DONALD E.

Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lida p 25 A87-38840

HO. DIEM A soil thermal model for remote sensing

p 5 A87-35521 HOCK, JOAN C.

Preliminary report on the development of marine geographic information systems p 23 A87-37056 HOELL JAMES M., JR.

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 HOFMANN, OTTO

The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768

HOLBEN, BRENT

HOLLIER, P.

Satellite detection of tropical burning in Brazil p 8 A87-39191

Definition of a thermal infrared pushbroom imager for p 53 N87-24765 HOLT, BENJAMIN M.

The age and source of ocean swell observed in Hurricane Josephine p 25 A87-38843

HOOGEBOOM, P. Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies p 8 A87-39187

HORNING, NED Continental land cover assessment using Landsat MSS

p 3 A87-32095 HORTON, C. A. Determination of spectral reflectance of crops during

growth from calibrated multispectral small format aeric p 12 N87-24801 photography HORTON, CHARLES

An application of low altitude multispectral photography to agricultural field trials p 6 A87-37054 HOSOMURA, TSUKASA

Global vegetation monitoring using NOAA vegetation p 3 A87-32495 HOUGHTON, R. A.

Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p 4 A87-33441 HUBERTZ, JON M.

DUCK '85 nearshore waves and currents experiment data summary report [AD-A177419] p 31 N87-22382 HUNKINS, K. L.

Mesoscale oceanographic processes beneath the ice of Fram Strait p 28 A87-40434 HUSSEY, M. A.

Ground and aenal use of an infrared video camera with a mid-infrared filter (1.45 to 2.0 microns)

p 48 A87-41588

Reflectivity of earth's surface and clouds in ultraviolet from satellite observations p 47 A87-40768

IMHOFF, MARC L.

Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsat p 35 A87-39467

ISAEV. A. A.

Remote-sensing method for determining monthly precipitation sums using Meteor-satellite data on the Atlantic Ocean p 21 A87-34447

ISHIZAWA, YOSHIHIRO

Marine Observation Satellite-1 (MOS-1)

p 20 A87-32499 Earth resources satellite-1 (ERS-1) p 44 A87-32501 IVANCHIK, M. V.

Cloud-cover and precipitation patterns over the Republic of Guinea according to ground-based and satellite p 35 A87-36102 observations

JACKSON, FREDERICK C.

The physical basis for estimating wave-energy spectra with the radar ocean-wave spectrometer

p 25 A87-38839 The Radar Ocean-Wave Spectrometer

p 25 A87-38846 JACKSON, M. L. W.

LANDSAT-based lineament analysis. East Texas Basin, and structural history of the Sabine Uplift area, East Texas and North Louisiana

p 19 N87-24043 IPB87-1763271 JACKSON, T. J.

Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094 JACKSON, THOMAS J.

Salinity effects on the microwave emission of soils p 5 A87-35520

The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p 16 N87-22290 JAMES, JOHN V.

OH measurement near the intertropical convergence p 21 A87-33430 zone in the Pacific JANSE, A. R. P.

Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studie p 8 A87-39187

JAY, G. C. NASA/MSFC large stretch press study

[NASA-CR-180376] p 41 N87-20554 JEANNIN, P. F. Mesoscale oceanographic processes beneath the ice

p 28 A87-40434 of Fram Strait JEGOU, J. P.

Energy Balance of the Tropical Systems (REST): A space p 36 N87-22373 experiment proposition JELINEK, D. A.

Measured radar return at the near vertical from forested terrains

I DE87-0093841 p 11 N87-24593 JÈNSEN, JOHN R.

Inland wetland change detection using aircraft MSS p 36 A87-42256 JIA, WEN-KUI

Exploration of geomagnetic field anomaly with balloon or geophysical research p 17 A87-32478 for geophysical research

JOHANNESSEN, J. A.

Ice-edge eddies in the Fram Strait marginal ice zone p 27 A87-40432 JOHANNESSEN, O. M.

Ide-edge eddies in the Fram Strait marginal ice zone p 27 A87-40432 Remote sensing of the Fram Strait marginal ice zone p 27 A87-40433

JOHNSON, GARY E. The use of AVHRR data in operational agricultural

p 9 A87-40304 assessment in Africa JOHNSON, J. W. Airborne microwave Doppler measurements of ocean

p 26 A87-39180 wave directional spectra

JOHNSON, L. RONALD

The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data -D 35 A87-40249 preliminary investigation

JOLMA, PETRI A.

Applications of satellite microwave radiometry in Finland p 44 A87-32952

JONES, ARWYN RHYS

Landform investigation utilizing digitally processed satellite Thematic Mapper imagery p 38 A87-36546 JONES. VERNON K.

impact of climate change from increased atmospheric carbon dioxide on American agriculture IDOE/NBB-00771 p 11 N87-23032

JOSBERGER, E. G.

Remote sensing of the Fram Strait marginal ice zone p 27 A87-40433

JUPP, DAVID L. B.

Coral reef remote sensing applications

p 20 A87-32951

Κ

KALB. VIRGINIA

Comparison of North and South American biomes from AVHRR observations KALNAY, FUGENIA

impact of satellite-based data on FGGE general p 44 A87-32985 circulation statistics KAMEDA KAZUAKI

Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data p 12 A87-32494

KAUFMAN, YORAM J.

Satellite sensing of aerosol absorption

p 47 A87-40770

KAWATA, YOSHIYUKI Spectral classification of Landsat-5 Thematic Mappel data p 37 A87-32488 Correction for atmospheric and topographic effects on

the Landsat MSS data p 37 A87-32489 KAZMIN. A. S.

Surface manifestations of hydrophysical processes in the Strait of Gibraltar according to 'Salvut-6' p 35 A87-36103 photographs

KELLER, SAM p 47 A87-40379 Space remote sensors

KELLER, W. C.

Airborne microwave Doppler measurements of ocean wave directional spectra p 26 A87-39180 KELLY, GAIL D.

Habitat mapping by Landsat for aerial census of p 2 A87-32094 kangaroos

KERBER, ARLENE

Comparison of North and South American biomes from AVHRR observations p 9 A87-40303 KERR. Y. H.

Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data p 47 A87-40246 KESHENG, S.

Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432

KETSKEMETY, L.

The application of remote sensing in agricultural meteorology at the Meteorological Service of the HPR D 2 A87-32010

KHORRAM, SIAMAK

Comparison of Landsat MSS and TM data for urban land-use classification p 13 A87-35523 KHOSRAVIANI, G.

A two-look technique for studying atmospheric effects in optical scanner data for the ocean p 26 A87-39178

A model for the use of satellite remote sensing for the measurement of primary production in the ocean

p 29 A87-42644

KILGUS, CHARLES C.

observed by Meteosat

A Spectrasat system design based on the Geosat p 26 A87-38848 KIM, HONGSUK H.

Sunlight induced 685 nm fluorescence imagery p 30 A87-42646

KINDRED D.R. A curious sea-surface-temperature phenomenon

p 19 A87-31572

KING, DOMINIC Sensors for imaging p 45 A87-36360

KIRCHHOF, W. Comparative analysis of Thematic Mapper and SPOT

image data for land use investigation p 51 N87-24746 KIREEV, S. V.

Physical principles of image convergence in remote sensing p 40 A87-41925

KISELEV, V. V.

Problems in the automation of map-compilation processes on the basis of remote-sensing data

p 38 A87-35925

Optical dynamics experiment (ODEX) data report R/V acania expedition 10 October-17 November 1982. Volume Particle size distributions. Volume 6 Scalar spectral-radiometer data

IAD-A1785351 KLEMAN, JOHAN

Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 KLEMAS, V.

Measurement of the surface emissivity of turbid p 19 A87-32097 Remote sensing of coastal wetlands waters

KLINK, JOHN C.

An evaluation of satellite-based insolation estimates for p 34 A87-33297

KOHNO, ITOSHI

Simulation software of synthetic aperture radar p 37 A87-32506

KOJIMA, MASAHIRO Airborne observation experiments for MOS-1 verification

rogram (MVP) p 44 A87-32500 KOMAL JIRO

Simulation software of synthetic aperture radai

p 37 A87-32506 KOMEN, GERBRAND J.

Recent results with a third-generation ocean-wave p 24 A87-38833

KONDRATEV, KIRILL IAKOVLEVICH

Aerial and space investigations of soils and vegetation p 6 A87-36579

KONENCY, G.

Introduction of geometric information to radar image p 42 N87-24754 data

KONG, J. A.

Radar scene generation for tactical decision aids [NASA-CR-180234] p 40 N87-20449

KONG, JIN A. Active and passive remote sensing of ice

AD-A179461 p 32 N87-24009

KÖVALICK, W.

Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p 4 A87-33441

KOZODEROV, VLADIMIR VASILEVICH Aerial and space investigations of soils and vegetation

p 6 A87-36579 KRASIUK, V. S.

Rapid analysis of satellite radar images of sea ice p 22 A87-35873

Aerial triangulation of CCD line-scanner images p 54 N87-24769

KUCHLER, DEBORAH A.

Coral reef remote sensing applications p 20 A87-32951

KUNKEL, B. Advanced imaging spectrometer for ocean olor/fluorescence measurements and further color/fluorescence

p 33 N87-24766

KUPFER, G.

Geometrical system calibration, especially for metric aerial cameras p 51 N87-24745

KUSAKA, TAKASHI

Spectral classification of Landsat-5 Thematic Mapper p 37 A87-32488 data

KUX, HERMANN J. H.

Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies. Test site: Pantanal Region (Brazil/Paraguay) p 52 N87-24748

KUZENKOV, L. A.

Statistical evaluation of forest characteristics from aerial and space photographs

KWOK, RONALD

Rectification of terrain induced distortions in radar ımagery p 48 A87-42254

L

LABOVITZ, M. L.

Stochastic nature of Landsat MSS data p 46 A87-38093

LABOVITZ, MARK L.

Derivation of a fast algorithm to account for distortions due to terrain in earth-viewing satellite sensor images p 38 A87-35524

LANDREVILLE, M. L.

Proposed changes to the Canadian camera calibration report p 53 N87-24757 LANZL, F.

Land panel report p 49 N87-20634 Earth observation experiments on the German Spacelab p 55 N87-24811 mission D2 The Monocular Electro-Optical Stereo Scanner (MEOSS) satellite experiment p 55 N87-24812

LAYBE, PATRICK

The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data preliminary investigation p 35 A87-40249

LE GOUIC. M.

Aircraft radiopositioning for airborne photography during hydrographic coastal surveys p 23 A87-36945 LECROY, STUART R. Surface bidirectional reflectance properties of two

southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers NASA-TP-26431 p 49 N87-22281

LEGECKIS RICHARD

Long waves in the equatorial Atlantic Ocean during 1983 p 23 A87-37564

LEICHT, DIETER

Strategies and technologies for monitoring environment p 14 A87-39593 LEROY, M.

SPOT image quality p 42 N87-24804

LESZTAK, S. The application of remote sensing in agricultural meteorology at the Meteorological Service of the HPR

p 2 A87-32010

p 16 N87-23018

p 31 N87-22386

LICHTENBERGER, J.

Remote sensing methods of yield forecasting

p 2 A87-32009 Surface models including direct cross-radiation - A p 40 A87-39189 mple model of furrowed surfaces LINDER, HENRY G.

Quick-look guide to the crustal dynamics project's data

INASA-TM-878181

LINTHICUM, KENNETH J. Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A87-37827

LIU. HUA-KUANG

Optical image subtraction techniques, 1975-1985

p 40 A87-42659 LIU, W. TIMOTHY

The 1982-1983 El Nino Atlas: Nimbus-7 microwave

radiometer data [NASA-CR-180914]

LIU, WEN-YAO Measurement of the surface emissivity of turbic p 19 A87-32097

LIVINGSTONE, CHARLES E.

Seasonal and regional variations of active/passive microwave signatures of sea ice p 22 A87-35516 Microwave sea-ice signatures near the onset of melt p 22 A87-35517

LO. CHOR PONG p 45 A87-33122

Applied remote sensing LOEDEMAN, J. H.

Determination of spectral reflectance of crops during growth from calibrated multispectral small format aeria photography p 12 N87-24801

MIDAS - A new image-processing system for remote p 37 A87-35183 sensina

LOHMANN, P.

Aerial triangulation of CCD line-scanner images p 54 N87-24769

LONG. CHARLES E.

DUCK '85 nearshore waves and currents experiment data summary report IAD-A1774191 p 31 N87-22382

LONGUET-HIGGINS, M. S.

The propagation of short surface waves on longer gravity p 28 A87-40835 waves

LORCH, W.

The RMK aerial camera system: Performance potential of aerial photography with forward motion compensation p 54 N87-24781

LOTZ-IWEN, H.-J.

MIDAS - A new image-processing system for remote p 37 A87-35183 sensing

LOWMAN, PAUL D., JR.

Shuttle Imaging Radar (SIR-B) investigations of the p 17 A87-31410 Canadian shield - Initial Report

LUCAS, JAMES R. Aerotriangulation without ground control

p 46 A87-37289

LUCCHITTA, B. K. Enhanced LANDSAT images of Antarctica and planetary exploration p 50 N87-23558

LUEST, REIMAR

Arianespace top performance benefits ESA

p 57 N87-24493

LUTZ A

Advanced imaging spectrometer for plor/fluorescence measurements and color/fluorescence measurements further p 33 N87-24766 applications

LYON, JOHN GRIMSON

Use of maps, aerial photographs, and other remote sensor data for practical evaluations of hazardous waste p 14 A87-42255 sites

LYON, RONALD J. P.

Mid-infrared remote sensing systems and their p 17 A87-35522 application to lithologic mapping

MA, CHOPO

Creation of a global geodetic network using Mark III VLB: p 15 A87-36166

MACARTHUR, JOHN L.

Spectrasat instrument design using maximum heritage p 26 A87-38847

MACKEY, HALKARD E., JR.

Inland wetland change detection using aircraft MSS p 36 A87-42256

MAEDA, KOREHIRO

Airborne observation experiments for MOS-1 verification p 44 A87-32500 program (MVP)

MALIN, JANICE A.

Models for radar scatterer density in terrain images p 45 A87-35344

MANLEY, T. O.

Mesoscale oceanographic processes beneath the ice of Fram Strait p 28 A87-40434

MARKHAM, B. L.

Thematic Mapper bandpass solar exoatmospheric p 40 A87-39192

MARKWITZ, W.

MIDAS - A new image-processing system for remote p 37 A87-35183 sensing

MARTIN. A

CHART A computer plotting package for the display of position-dependent marine data LPB87-1486071 p 31 N87-22297

MARTIN, DAVID W.

Quick look Atlantic Ocean rain maps for gale

INASA-CR-180511| p 30 N87-21533 MARULLO, S.

Remotely sensed sea surface temperature for the Alpine p 30 N87-21497 Experiment (ALPEX)

MARVIN, JOHN W. Derivation of a fast algorithm to account for distortions

due to terrain in earth-viewing satellite sensor images p 38 A87-35524

MASUDA, TAKESHI

Marine Observation Satellite-1 (MOS-1)

p 20 A87-32499

MASUKO, HARUNOBU

Observation of precipitation from space by the weather p 44 A87-32507

MASUOKA, E. J.

Stochastic nature of Landsat MSS data

p 46 A87-38093

MASUOKA, PENNY M.

Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p 17 A87-31410 MATSON MICHAEL

Satellite detection of tropical burning in Brazil

p 8 A87-39191

MATTHEWS, ELAINE

Regional and seasonal variations of surface reflectance from satellite observations at 0.6 micron

p 27 A87-40250

MAUSER, W.

Comparative analysis of Thematic Mapper and SPOT image data for land use investigation p 51 N87-24746 MAY, L. NELSON, JR.

Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries

INASA-CR-1809841 p 33 N87-24012

MAYER, G.

Stereoscopic line scan imaging and satellite control [DGLR PAPER 86-106] p 38 A87-36757

MAYNARD, NANCY G.

Coastal zone color scanner imagery of phytoplankton pigment distribution in Idelandic waters

p 29 A87-42645

MCCOLL, W. D.

The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager. Four years of operation p 53 N87-24767

MCCRACKEN, KENNETH G.

Australian utilization and research into remote sensing p 20 A87-32490 MCDONALD, KYLE C.

Relating polarization phase difference of SAR signals p 1 A87-31413 to scene properties

MCDOUGAL, DAVID S. Operational overview of NASA GTE/CITE 1 airborne

instrument intercomparisons - Carbon monoxide, nitrio oxide, and hydroxyl instrumentation p 45 A87-33426 MCDOUGAL, PATRICK

Intelsat's small earth stations - Impact on the developing p 56 A87-34799

MCELROY, JAMES L. Lidar observation of elevated pollution layers over Los p 13 A87-33292

MCFARLAND, MARSHALL J.

Nimbus 7 SMMR investigation of snowpack properties in the northern Great Plains for the winter of 1978-1979 p 34 A87-31409

MCGARRY, JAN F.

Two-color short-pulse laser altimeter measurements of ocean surface backscatter p 27 A87-39462 MCMAHON MOORE, JOHN

Landsat image enhancement study of possible submerged sand-dunes in the Arabian Gulf p 22 A87-35315

Energy Balance of the Tropical Systems (BEST). A space experiment proposition p 36 N87-22373

MEHLBREUER, ALFRED

Digital data photogrammetry acquisition for close-range p 54 N87-24785 MEISSNER, D.

The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuer Forschung und Technologie (BMFT) Milestones in the development of an operational Earth Observation p 55 N87-24815

MELBOURNE, W. G.

GPS-based geodesy in California, Mexico and the p 16 A87-41380

MENSHIKH, A. E.

Problems in the automation of map-compilation processes on the basis of remote-sensing data p 38 A87-35925

MENZIES, DAVID W.

Optical dynamics experiment (ODEX) data report R/V acania expedition 10 October-17 November 1982, Volume Particle size distributions, Volume 6 Scalar spectral-radiometer data p 32 N87-23104 LAD-A1785351

MERRITT, NORMAN E.

Comparison between digital and manual interpretation p 48 A87-42257 of high altitude aerial photographs MESIAS, JORGE M.

The interaction of light with phytoplankton in the marine p 29 A87-42640 environment

MEYER, DAVID S.

French spot and the U.S. Landsat jockey for position in the race for a multimillion-dollar remote sensing p 56 A87-34600

MIDDLETON, ELIZABETH M.

Computation of diffuse sky irradiance from multidirectional radiance measurements p 6 A87-37279

MILBERT, DENNIS

The Geosat altimeter mission - A milestone in satellite oceanography p 27 A87-40281

MILLER, BERNARD L.

Convective heating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982

MILLER, JAMES R., JR.

The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data - A investigation p 35 A87-40249

MILLER LAURY

The Geosat altimeter mission - A milestone in satellite p 27 A87-40281

MIVASHITA KIYOF

Fundamental study on systematization of selecting new development area with Landsat data and topographic informations p 12 A87 32496

The Tethered Satellite System as a new remote sensing p 46 A87-39183 platform MOGILSKI, KELLY A.

Urban land use separability as a function of radar p 14 A87-39188 polarization MONALDO, FRANK M.

A practical methodology for estimating wave spectra from the SIR-B p 25 A87-38841

The Geomulti database management system

p 39 A87-37802 p 39 A87-37803 Multisatellite data processing MOREL, A.

Ocean-ice panel report p 30 N87-25635 MORRIS. PETER T.

OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430

MUELLER, JAMES L.

Simulation of wind gradient errors in NROSS (Navy Remote Ocean Sensing System) radar scatterometer data in a simplified geometry

IAD-A1757541

o 49 N87 20642

MUIRHEAD, K. AVHRR data services in Europe

The Earthnet p 39 A87-37922 approach

MULDER, NANNO J.

What, where, when \_\_, why? Extracting information from remote sensing data p 46 A87-37055

Studies of the east Australian current off northern New South Wales

MUNEYAMA, KEI

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz

p 22 A87-35515

MURAI, SHUNJI Earth Resources Satellite (ERS-1) project in Japan p 57 N87-24797

MURATA, MASAAKI

Earth rotation, station coordinates and orbit determination from satellite laser ranging p 43 A87-32349

MURPHY, JENNIFER M.

Radiometric comparison of the Landsat-5 TM and MSS sensors p 47 A87-41432

N

NAGESWARA RAO, P. P.

Rice crop identification and area estimation using remotely-sensed data from Indian cropping patterns

Spectrophotometric measurements on color aerial photographs p 55 N87-24798

NAHVI, M. J.

Smart sensors. An overview and selected examples p 51 N87-24740

NAITO, GENICHI

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz p 22 A87-35515

NAKAMURA, KENJI

Observation of precipitation from space by the weather p 44 A87-32507 radar

NAKAYAMA, YASUNORI

Relation between precipitation and brightness of earth surface in the NOAA/GVIP data p 3 A87-32498 NASONOVA, O. N.

Remote-sensing method for determining monthly precipitation sums using Meteor-satellite data on the Atlantic Ocean p 21 A87-34447 NAZIROV. M.

Rapid analysis of satellite radar images of sea ice

p 22 A87-35873 NEALSON, W. P. NASA/MSFC large stretch press study

[NASA-CR-180376]

p 41 N87-20554 NELSON, R. F. Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p.4 A87-33441

NELSON, ROSS Continental land cover assessment using Landsat MSS data p 3 A87-32095

NEVILLE, R. A.

The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager: Four years of operation p 53 N87-24767

NEWCOMB, W. W. Monitoring vegetation using Nimbus-7 scanning mutichannel microwave radiometer's data

NIKITIN, P. A.

Rapid analysis of satellite radar images of sea ice p 22 A87-35873

NIXON, P. R.

Ground and aerial use of an infrared video camera with a mid-infrared filter (1.45 to 2.0 microns)

p 48 A87-41588

NOLL, CAREY E. Quick-look guide to the crustal dynamics project's data information system INASA-TM-878181 p 16 N87-23018

p 8 A87-39194

**NOVIKOV, IULIAN** 

Environmental protection from space

p 13 A87-36363

O'NEILL, P.

Temporal observations of surface soil moisture using p 7 A87-38094 a passive microwave sensor

OCHIAI, HIROAKI

Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p 20 A87-32497

OFTTL HERWIG

Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR n 44 A87-32505

**OGURA, IWAO** 

Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity o light scattering p 12 A87-32493

OKAMOTO KENICHI

Observation of precipitation from space by the weather p 44 A87-32507

OKAYAMA, HIROSHI

Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity on light scattering p 12 A87-32493

OLSON, CHARLES E., JR.

Evaluation of the airborne imaging spectrometer for remote sensing of forest stand conditions [NASA-CR-180918] p 10 N87-22296

ONEILL, PEGGY E.

Salinity effects on the microwave emission of soils

p 5 A87-35520 ONO. MAKOTO

Simulation software of synthetic aperture radar

p 37 A87-32506

ONSTOTT, R. G.

Microwave sea-ice signatures near the onset of melt p 22 A87-35517

Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern p 5 A87-35309

**OSHIMA, TAICHI** 

Fundamental study on systematization of selecting new development area with Landsat data and topographic p 12 A87-32496

OTTERMAN, J.

Inferring spectral reflectances of plant elements by reflectance simple inversion of bidirectional measurements p 7 A87-37281

**OUCHI, KAZUO** 

Multilook images of ocean waves by synthetic aperture p 28 A87-41068 radars

OWE, M.

Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309

PAK, HASONG

Optical dynamics experiment (ODEX) data report R/V acania expedition 10 October-17 November 1982. Volume 2: Particle size distributions. Volume 6: Scalar spectral-radiometer data IAD-A1785351 p 32 N87-23104

PANG, SHIRLEY S.

Rectification of terrain induced distortions in radar p 48 A87-42254 imagery

PARKINSON, CLAIRE L.

Arctic Sea ice, 1973-1976: Satellite passive-microwave observations INASA-SP-4891 p 33 487-24870

PARKS, NANCY F.

High resolution remote sensing of spatially and spectrally complex coal surface mines of central Pennsylvania - A comparison between simulated SPOT MSS and Landsat-5 p 18 A87-39468 thematic mapper

Energy Balance of the Tropical Systems (BEST): A space experiment proposition p 36 N87-22373

PERRY, J. R.

The SIR-B mission: Towards an understanding of internal waves in the ocean

[ARE-TR-86122] p 32 N87-23102

PERRY, MARY JANE

The interaction of light with phytoplankton in the marinenvironment p 29 A87-42640 PETERSEN, GARY W.

High resolution remote sensing of spatially and spectrally complex coal surface mines of central Pennsylvania - A comparison between simulated SPOT MSS and Landsat-5 thematic mapper p 18 A87-39468

PFEIFFER, B.

The Earth observation activities of the European Space Agency and the use of the polar platform of the International Space Station p 49 N87-20622 p 49 N87 20622

PHILIPSON, WARREN R.

Identifying vegetable crops with Landsat Thematic p 4 A87-35120

PHILPOT, WILLIAM D.

Identifying vegetable crops with Landsat Thematic Mapper data

PHINNEY, DAVID A.

The relationship between phytoplankton concentration and light attenuation in ocean waters p 29 A87-42642

PICKETT, R. L. Ocean wind and wave model compansons with GEOSAT (GEOdesy SATellite) satellite data

IAD-A1783021 p 33 N87-24061

PIERSON, WILLARD J., JR.

Some approaches for comparing remote and in-situ estimates of directional wave spectra p 24 A87-38835

PILLAI, SREE

Continental land cover assessment using Landsat MSS p 3 A87-32095

PINKER, R. T.

Simulations of the GOES visible sensor to changing surface and atmospheric conditions p 47 A87-40756

PION, JEAN-CLAUDE

First results of lateritic cover mapping with SPOT images The Kangaba region (South-Mali) p 18 A87-36925

PLACE, J. L. Radar as a complement to topographic maps for delineating marine terraces

[PB87-154597]

PLANT, W. J.

Airborne microwave Doppler measurements of ocean vave directional spectra p 26 A87-39180

p 41 N87-24013

PLANT, WILLIAM J. The microwave measurement of ocean-wave directional

spectra

p 24 A87-38836 PLUMMER, J. E. W. Proposed changes to the Canadian camera calibration

report

p 53 N87-24757 PLUMMER, S. E. A polar platform for the remote sensing needs of ecology

and agriculture - A view from the U.K. p 9 A87-41430

POLCARO, VITO FRANCESCO Balloon-borne infrared multichannel radiometer for remote sensing of high resolution low-level water vapor p 43 A87-32477

POHWELS H

A modular and versatile acquisition, recording and preprocessing system for airborne remote sensing p 52 N87-24751

POWERS, B. J.

Modelling of atmospheric effects on the angular distribution of a backscattering peak [DE87-0060601 p 41 N87-24014

PRICE, JAMES F.

Satellite measurements of sea surface cooling during p 24 A87-37886 hurricane Gloria

Calibration of satellite radiometers and the comparison p 2 A87-32091 of vegetation indices Combining panchromatic and multispectral imagery from p 38 A87-37276 dual resolution satellite instruments

PRYOR, ARTHUR W.

Mid-infrared remote sensing systems and their application to lithologic mapping p 17 A87-35522 p 17 A87-35522 PUIGCERVER, MANUEL

Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence on microwave communications planning and rain-rate data p 46 A87-36933

PULS. J.

Stereoscopic line scan imaging and satellite control IDGLR PAPER 86-106] p 38 A87-36757

**PURGOLD, G. CARLTON** 

Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers (NASA-TP-2643) p 49 N87-22281

PUTSAY, M.

The application of remote sensing in agricultural meteorology at the Meteorological Service of the HPR

p 2 A87-32010 PYT'FY III P

Physical principles of image convergence in remote p 40 A87-41925

RABAGLIATI, RICCARDO

Development of a satellite remote sensing technique for the study of alpine glaciers p 34 A87-35311

Measurement of the spatial spectrum of ocean waves using a two-frequency scatterometer p 23 A87-36107

Data Compression System for video images

p 46 A87-37421

RAJYALAKSHMI, P. S.

Data Compression System for video images p 46 A87-37421

RAMPINI, ANNA

Development of a satellite remote sensing technique for the study of alpine glaciers p 34 A87-35311 RAMSEY, ELIJAH W.

Inland wetland change detection using aircraft MSS data p 36 A87-42256

RANSON, K. J.

Inferring spectral reflectances of plant elements by reflectance simple inversion of bidirectional p 7 A87-37281

RAO, DESIRAJU B. Tidal estimation in the Atlantic and Indian Oceans, 3 deg x 3 deg solution

INASA-TM-878121 p 30 N87-21534

Rice crop identification and area estimation using remotely-sensed data from Indian cropping patterns

RAST. M.

Definition of a thermal infrared pushbroom imager for Earth observation p 53 N87-24765 REDONDO, F. V.

Landsat classification of Argentina summer crops

REEVES, A. B. Airborne microwave Doppler measurements of ocean vave directional spectra REVERDIN GILLES

Long waves in the equatorial Atlantic Ocean during

REYNOLDS, M. L.

Definition of a thermal infrared pushbroom imager for Earth observation p 53 N87-24765 RICHTER RUDOLE

Infrared Earth horizon sensor concepts in various spectral bands p 52 N87-24752

RIDLEY, B. A. Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431

RIOM, J. Nadir looking airborne radar and possible applications p 7 A87-38095 to forestry

RIVERS, PANOLA DUCK '85 nearshore waves and currents experiment data summary report

[AD-A177419] p 31 N87-22382

ROBERTS, G. A. An expert system for labeling segments in forward looking infrared (FLIR) imagery p 40 A87-42628 RODGERS, M. O.

Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432

ROHRBACH, ARTHUR

Wild Aviophot (TM) RC20 aerial camera system. The other approach to image motion compensation in aerial photography p 54 N87-24782

Proceedings of the European Symposium on Polar platform Opportunities and Instrumentation for Remote-Sensing (ESPOIR)

[ESA-SP-266] p 48 N87-20621 Proceedings of the International Symposium on Progress

in Imaging Sensors (ESA-SP-252) p 50 N87-24738

ROQUIN, CLAUDE

First results of lateritic cover mapping with SPOT images p 18 A87-36925 The Kangaba region (South-Mali) ROSEN, RICHARD D.

Impact of satellite-based data on FGGE general circulation statistics p 44 A87-32985

ROSENBRUCH, K.-J. Optical Transfer Function (OTF)-based quality criteria

for aerial cameras and imaging systems p 51 N87-24742

ROSENTHAL, ALAN

Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent

INASA-CR-1809841

p 33 N87-24012

ROSSOW, WILLIAM B.

Regional and seasonal variations of surface reflectance satellite observations at 0.6 micron

p 27 A87-40250

ROTHACHER, M.

Using the Global Positioning System (GPS) for high precision geodetic surveys - Highlights and problem p 16 A87-41383

ROTHERY, DAVID A

Synergistic use of MOMS-01 and Landsat TM data p 46 A87-39190

ROURE, FRANÇOIS

Fault patterns by space remote sensing and the rotation of western Oregon during Cenozoic times

p 18 A87-36525

ROWNTREE, ROWAN A.

Testing the consistency for mapping urban vegetation with high-altitude aerial photographs and Landsat MSS p 13 A87-37277

ROY, PARTH SARATHI

Montane vegetation stratification through digital processing of Landsat MSS data p 9 A87-40302 ROYER, ALAIN

Radiometric comparison of the Landsat-5 TM and MSS p 47 A87-41432 sensors

RULEY, D. N.

Optimization of a program of experiments in connection with the operational planning of studies carried out i p 56 A87-34208 a spacecraft

RYAN, JAMES W.

Creation of a global geodetic network using Mark III VLBI

RZHEPLINSKIY, D. G.

Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during p.31 N87-21980

S

SACHSE, GLEN W.

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 Carbon monoxide measurements over the eastern p 21 A87-33435 Pacific during GTE/CITE 1

SACHSE, GLENN

Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196

SADER, STEVEN A.

Multipolarization SAR data for surface feature delineation and forest vegetation characterization p 1 A87-31411

Forest biomass, canopy structure, and species composition relationships with multipolarization L-band synthetic aperture radar data p 4 A87-35121

Airborne remote sensing of forest biomes p 9 A87-40301

SADOWSKI, FRANK G.

Testing the consistency for mapping urban vegetation with high-altitude aerial photographs and Landsat MSS p 13 A87-37277 data

SAHAI, BALDEV

Geochronological studies of strandlines of Saurashtra, India, detected by remote sensing techniques

p 15 A87-35308

SAITO, NORIO

Earth resources satellite-1 (ERS-1) p 44 A87-32501 SAKAMOTO, CLARENCE M. The use of AVHRR data in operational agricultural p 9 A87-40304

assessment in Africa SAKATA, TOSHIBUMI

Global vegetation monitoring using NOAA vegetation p 3 A87-32495 index data

SALSTEIN, DAVID A.

impact of satellite-based data on FGGE general circulation statistics p 44 A87-32985

SANCHEZ, BRAULIO V.

Tidal estimation in the Atlantic and Indian Oceans, 3 deg x 3 deg solution p 30 N87-21534

[NASA-TM-87812]

SANDHAM, L. A.

Landsat as an aid in evaluating the adequacy of a grain ito network p 7 A87-37282 silo network

SANDHOLM, S. T.

Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432

SANDWELL, DAVID T.

Biharmonic spline interpolation of GEOS-3 and Seasat altimeter data p 20 A87-32770 SASAKI, YASUNORI

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz

p 22 A87-35515

p 49 N87-20624

p 4 A87-35122

p 19 A87-31592

SCALA, JOHN Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 SCHILDKNECHT, T.

Using the Global Positioning System (GPS) for high precision geodetic surveys - Highlights and problem p 16 A87-41383

SCHLIENGER, ROLAND

Wild Aviophot (TM) RC20 aerial camera system. The other approach to image motion compensation in aena p 54 N87-24782 photography SCHLUDE F.

European utilization aspects studies

SCHLUESSEL P.

Companson of satellite-derived sea surface temperatures with in situ skin measurements p 23 A87-37565

SCHMUGGE, T.

Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies A87-39187

SCHMUGGE, THOMAS

Remote sensing applications in hydrology p 35 A87-40308

SCHNEIDER, MANFRED

Report on the Special Program 78 satellite geodesy of

(ASTRON-GEODAET-ARB-48) p 16 N87-20618 SCHNEIDER, W.

Photographic quality of color IR senal photos as a function of atmospheric parameters p 42 N87-24799 SCHOELLER, W.

Application of Global Positioning System (GPS) receivers for Earth observation p 53 N87-24763 SCHREUDER, HANS T.

comparison of optical bar, high-attitude, and black-and-white photography in land classification p 4 A87-35122

SCHROEDER, M.

Exposure test with high resolution films from high p 54 N87-24775 SCHUHR, W.

Introduction of geometric information to radar image p 42 N87-24754 SCHUTZ. B. E.

Altimeter measurements for the determination of the Earth's gravity field o 17 N87-23033

[NASA-CR-1805201 SCOTT, CHARLES T.

comparison of optical bar, high-altitude, and black-and-white photography in land classification

The SIR-B mission: Towards an understanding of internal waves in the ocean p 32 N87-23102

SCOTT, JOHN F.

Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar p 25 A87-38840

Modern CCD sensors and their applications in Earth observation and planetary missions oservation and planetary missions p.55 N87-24813 The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuer Forschung und Technologie (BMFT). Milestones in the development of an operational Earth Obse vation p 55 N87-24815 SELLERS, P. J.

Canopy reflectance, photosynthesis, and transpiration. II - The role of biophysics in the linearity of their p 6 A87-37278 interdependence

SENIOR, THOMAS B. A.

Relating polarization phase difference of SAR signals p 1 A87-31413 to scene properties

SERANDREI BARBERO, ROSSANA

Development of a satellite remote sensing technique p 34 A87-35311 for the study of alpine glaciers SEVOSTIANOV, A. I.

Cloud-cover and precipitation patterns over the Republic of Guinea according to ground-based and satellite p 35 A87-36102 observations SHABTAIE, SION

West Antarctic ice streams draining into the Ross Ice Shelf Configuration and mass balance

SHALAEV, V. S.

The geostructural characteristics of the rift zone on the Lambert glacier (Antarctica) according to space images p 18 A87-36105 SHARITZ, REBECCA R.

Inland wetland change detection using aircraft MSS ata p 36 A87-42256 data

SHIMODA, HARUHISA

Global vegetation monitoring using NOAA vegetation p 3 A87-32495 index data

SHIN, H.-Y.

Comparison of satellite-derived sea surface temperatures with in situ skin measurements p 23 A87-37565

SHUCHMAN, R. A.

ice-edge eddies in the Fram Strait marginal ice zone p 27 A87-40432

Remote sensing of the Fram Strait marginal ice zone p 27 A87-40433

SHUM, C. K.

Altimeter measurements for the determination of the arth's gravity field INASA-CR-1805201 p 17 N87-23033

SHVYRKOV, N. N.

Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during p 31 N87-21980 winter

SIMPSON, JOANNE Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196

SINGH, KESHAVA P.

Seasonal and regional variations of active/passive microwave signatures of sea ice p 22 A87-35516 Microwave sea-ice signatures near the onset of melt p 22 A87-35517

SINGHROY, VERNON H.

Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p 17 A87-31410 SKVORTSOV, E. I.

Measurement of the scattal spectrum of ocean waves using a two-frequency scatterometer p 23 A87-36107

SLANEY, VERNON ROY Shuttle Imaging Radar (SIR-B) investigations of the canadian shield - Initial Report p 17 A87-31410

SLOGGETT, DAVID

Remote sensing - Handling the data p 38 A87-36359

SMITH, FRED W.

Models for radar scatterer density in terrain images p 45 A87-35344

SMITH, PAUL H.

Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457

SMITH, TERENCE

Remote Sensing Information Sciences Research Group: Santa Barbara Information Sciences Research Group, year

[NASA-CR-181073]

SNOOK, PAUL W. Comparison between digital and manual interpretation p 48 A87-42257 of high altitude aerial photographs

SOLOMATIN, M. E. Problems in the automation of map-compilation processes on the basis of remote-sensing data p 38 A87-35925

SOMAYAJULU, B. L. K. Geochronological studies of strandlines of Saurashtra. India, detected by remote sensing techniques

p 15 A87 35308

p.43 N87-24817

p 15 A87-35308

SOOD, R. K. Geochronological studies of strandlines of Saurashtra, India, detected by remote sensing techniques

SOOHOO, JANICE BEELER A model for the use of satellite remote sensing for the measurement of primary production in the ocean p 29 A87-42644

SROKOSZ, M. A. The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface

p 26 A87-39179 The SIR-B mission: Towards an understanding of internal

waves in the ocean ARF-TH-861221 STALLINGS, CASSON

A model for the use of satellite remote sensing for the measurement of primary production in the ocean p 29 A87-42644

STAR, JEFFREY L.

Remote Sensing Information Sciences Research Group: Santa Barbara Information Sciences Research Group, year

[NASA-CR-181073] STEENROD, STEPHEN D. p 43 N87-24817

p 32 N87-23102

Tidal estimation in the Atlantic and Indian Oceans, 3 lea x 3 dea solution

p 30 N87-21534 INASA-TM-878121

STEINVALL, OVE

STIBIG. H. J.

Potential of laser remote sensing of oil below water surface

[FOA-C-30435-3.1]

p 30 N87-20659

Comparative analysis of Thematic Mapper and SPOT mage data for land use investigation p 51 N87-24746 STONE, T. A.

Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced ver high resolution radiometer imagery D 4 A87-33441 STORY, M. H.

Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsai p 35 A87-39467

STOW, D. A.

Remotely-sensed tracers for hydrodynamic surface flow p 26 A87-39176 estimation

STOWE, L. L.

Reflectivity of earth's surface and clouds in ultraviolet from satellité observations p 47 A87-40768

STRAHLER, ALAN H.

The factor of scale in remote sensing

p 39 A87-38096 STRAMMA, LOTHAR

Satellite measurements of sea surface cooling during hurricane Gloria STREAFL D.F.

Inferring spectral reflectances of plant elements by nal reflectance p7 A87-37281 inversion of bidirectional measurements

STREBEL, DONALD E.

Ten year change in forest succession and composition measured by remote sensing

[NASA-CR-180948] p 11 N87-24736

STRINGER, W. J.

Statistical description of the summertime ice edge in the Chukchi Sea, task 2 IDE87-0010561 p 31 N87-22387

STURDEVANT, JAMES A.

Testing the consistency for mapping urban vegetation with high-altitude aerial photographs and Landsat MSS data p 13 A87-37277

SUGA. YUZO

Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data

SUGIMOTO, NOBUO

Atmospheric environment monitoring system based on an earth-to-satellite Hadamard transform laser long-path absorption spectrometer - A proposal

p 12 A87-32494

p 45 A87-35502

SUGIMURA, TOSHIRO A study of elevation measurement using LFC hotograph p 43 A87-32491 photograph Landcover change in Hiroshima during 1979/1984

detected by Landsat MSS and TM data p 12 A87-32494

SUZUKI TSUTOMU

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz p 22 A87-35515

SVENDSEN, E.

Ice-edge eddies in the Fram Strait marginal ice zone p 27 A87-40432

SWIFT, ROBERT N.

Wave-measurement capabilities of the surface contour

radar and the airborne oceanographic lidar p 25 A87-38840

SZANGOLIES, KLAUS

The production of photographs of the Earth's surface taken from satellites and their application in map production and map revision p 55 N87-24788

T

TACONET. O.

Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A87-33298

TAKAHASHI, KOICHIRO World-wide weather

p 56 A87-33125

TAKAMURA, SHUNJI

Earth resources satellite-1 (ERS-1) p 44 A87-32501 TAKASHIMA, T.

Sea surface temperature measurement from space allowing for the effect of the stratospheric aerosols p 22 A87-35148

TAKAYAMA, Y.

Sea surface temperature measurement from space allowing for the effect of the stratospheric aerosols p 22 A87-35148 TAKEDA, KANAME

Monitoring of snow and ice in Hokkaido Island using multitemporal NOAA-AVHRR data p 20 A87-32497 TAKEUCHI, SHOJI

Monitoring of snow and ice in Hokkaido Island usin multitemporal NOAA-AVHRR data p 20 A87-3249 p 20 A87-32497

TANAKA, HIROKAZU

Simulation software of synthetic aperture radar p 37 A87-32506

TANAKA, SOTARO

A study of elevation measurement using LFC hotograph p 43 A87-32491 photograph Landcover change in Hiroshima during 1979/1984

detected by Landsat MSS and TM data p 12 A87-32494

Relation between precipitation and brightness of earth surface in the NOAA/GVIP data p 3 A87-32498 TANIS, FRED J.

Spatial characterization of acid rain stress in Canadian Shield lakes

NASA-CR-180983 p 36 N87-24031 Spatial characterization of acid rain stress in Canadian p 36 N87-24032

INASA-CR-1809821

TAO, WEI-KUO

Trace gas exchanges and transports over the p 12 A87-32196 Amazonian rain forest

Altimeter measurements for the determination of the

Earth's gravity field [NASA-CR-180520] p 17 N87-23033

TARCSAI, GY.

Remote sensing methods of yield forecasting p 2 A87-32009

Surface models including direct cross-radiation - A simple model of furrowed surfaces p 40 A87-39189

First results of lateritic cover mapping with SPOT images The Kangaba region (South-Mali) p 18 A87-36925

TEILLET, PHILIPPE M.

Radiometric comparison of the Landsat-5 TM and MSS sensors p 47 A87-41432

TESTUD. J.

Energy Balance of the Tropical Systems (BEST): A space experiment proposition p 36 N87-22373

The SIR-B mission: Towards an understanding of internal waves in the ocean IARE-TR-861221 p 32 N87-23102

THORNTON, C. L.,

GPS-based geodesy in California, Mexico and the Caribbean p 16 A87-41380

TILL, S. M.

The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager: Four years of operation

p 53 N87-24767 TILLEY, DAVID G.

The age and source of ocean swell observed in p 25 A87-38843 Hurricane Josephine TIMCHENKO, I. E.

Use of satellite altimetry for ocean monitoring p 23 A87-36101

TIMOFEEV, N. A.

Cloud-cover and precipitation patterns over the Republic of Guinea according to ground-based and satellite p 35 A87-36102 observations

TOPCHIEV, A. G.

Satellite techniques for studying ice crusts and underground waters in the eastern Pamir

TORRES, ARNOLD

Trace gas exchanges and transports over the p 12 A87-32196 Amazonian rain forest

TORRES, ARNOLD L.

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 TOSAYA, CAROL

Tectonic evaluation of the Nubian Shield of northeastern Sudan using Thematic Mapper imagery

[NASA-CR-180575] p 19 N87-22319

TREES, CHARLES C.

Remote sensing of chlorophyll concentrations in the p 29 A87-42643 northern Gulf of Mexico TRINDER, J. C.

Measurements on digitized hardcopy images

p 39 A87-37290

TSIUPAK, I. M.

The determination of earth-rotation parameters from p 15 A87-34186 satellite laser ranging TSONIS, A. A.

Determining rainfall intensity and type from GOES p 34 A87-32092 imagery in the midlatitudes

TUCKER, C. J.

Monitoring vegetation using Nimbus-7 scanning nutichannel microwave radiometer's data

p 8 A87-39194

TUCKER, COMPTON J. Detection of Rift Valley fever viral activity in Kenya by p 7 A87-37827 satellite remote sensing imagery

TUCKER, W. B., III

An evaluation of the polar ice prediction system p 41 N87-23014 IAD-A1785221

UENO. SUEO

Spectral classification of Landsat-5 Thematic Mapper data p 37 A87-32488 Correction for atmospheric and topographic effects on the Landsat MSS data p 37 A87-32489 ULABY, FAWWAZ T.

Relating polarization phase difference of SAR signals p 1 A87-31413 to scene properties

ULIANA, E. A. Airborne microwave Doppler measurements of ocean wave directional spectra p 26 A87-39180

**ULIVIERI, CARLO** Balloon-borne infrared multichannel radiometer for remote sensing of high resolution low-level water vapor

p 43 A87-32477 UMEZONO, SHUUHEI

Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data

p 12 A87-32494

VADASZ, V.

The application of remote sensing in agricultural meteorology at the Meteorological Service of the HPR p 2 A87-32010

VAN DER PIEPEN, HEINZ

N DER PIEPEN, HEIN∠ Sunlight induced 685 nm fluorescence imagery p 30 — A87-42646

VAN DIJK, ALBERT The use of AVHRR data in operational agricultural

assessment in Africa p 9 A87-40304

VAN R. CLAASEN, DANIEL B. Coral reef remote sensing applications

p 20 A87-32951

VAN RENSBURG, P. A. J.

Landsat as an aid in evaluating the adequacy of a grain

VANDERBILT, V. C.

Variations in the polarized leaf reflectance of Sorghum bicolor p 7 A87-38097

VANDIJK, ALBERT

A crop condition and crop yield estimation method based on NOAA/AVHRR satellite data p 10 N87-22280

VANHEE, DENNIS H.

Preliminary results obtained by DMAAC from the processing of a limited set of GEOSAT satellite radar altimeter data

IAD-A1790811 p 50 N87-24734

VASIL'EV. L. N.

Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space

p 10 A87-41771

VELTEN, ERICH H. The first ESA remote sensing satellite (status and p 57 N87-24777 outlook)

VERMILLION, C.

Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsat p 35 A87-39467 data

VETRELLA, S.

The Tethered Satellite System as a new remote sensing platform p 46 A87-39183

VIDAL-MADJAR, D.

Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature

p 3 A87-33298 Nadir looking airborne radar and possible applications p 7 A87-38095 Energy Balance of the Tropical Systems (BEST): A space

p 36 N87-22373

experiment proposition VILAR, ENRIC

Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence on microwave communications planning and rain-rate data p 46 A87-36933 acquisition

VILLANUEVA, J. Z.

Mesoscale oceanographic processes beneath the ice p 28 A87-40434 of Fram Strait

p.41 N87-22278

VINCENT, DAYTON G.

Convective heating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979

Remotely sensed sea surface temperature for the Alpine Experiment (ALPEX) p 30 N87-21497

VONDER HAAR, THOMAS H.

The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data - A p 35 A87-40249 preliminary investigation

VOROZHEIKIN, A. P.

Problems in the automation of map-compilation processes on the basis of remote-sensing data

p 38 A87-35925

Determination of the velocity of ocean gyres through ynthetic Aperture Radar p 22 A87-35314 Synthetic Aperture Radar

WAHR, JOHN M.

Polar motion-induced gravity p 15 A87-36176 WAKIMOTO, ROGER M.

Lidar observation of elevated pollution layers over Los p 13 A87-33292 Angeles

WALSH, EDWARD J.

Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar

p 25 A87-38840

WALTON, CHARLES

The AVHRR/HIRS operational method for satellite based sea surface temperature determination [NOAA-TR-NESDIS-28] p 31 N87-22388

WANG, CHARLES C.

OH measurement near the intertropical convergence zone in the Pacific p 21 A87-33430

WANG, J. R.

Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains p 5 A87-35309

WANG, LI

Automatic classification of Pointe d'Arcay landscapes using Thematic Mapper data with the aid of a textural analysis p 37 A87-35305 Introduction of initial centers for the algorithm of clustering around mobile centers p 37 A87-35313

WANG, PIN-QING

Predicting the location of kimberlite from a probability analysis of linear structure on remote sensing data p 18 A87-39186

WANG, RENXIANG

Estimating photogrammetric precision and cartographic p 42 N87-24791 potential of space imagery WELCH, R.

Merging multiresolution SPOT HRV and Landsat TM p 38 A87-37287

WENDEL, MELCHIOR

Observations of intermittent cumulus convection in the p 20 A87-32976 boundary layer

WESTWELL-ROPER, ANDREW

Mapping from space WETZEL, PETER J. p 38 A87-36361

Concerning the relationship between evapotranspiration p8 A87-40244 and soil moisture Soil moisture estimation using GOES-VISSR infrared

data - A case study with a simple statistical method p 8 A87-40248

WHITEHEAD, VICTOR S.

Polarized views of the earth from orbital altitude p 48 A87-42639

WHITLOCK, CHARLES H.

Surface pidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers

[NASA-TP-2643] p 49 N87-22281

WILKE, GREGORY D.

Nimbus 7 SMMR investigation of snowpack properties in the northern Great Plains for the winter of 1978-1979 p 34 A87-31409

WILLIAMS, JONATHAN

Remote sensing - Handling the data

p 38 A87-36359

WILLIAMS, LARRY D.

The relation of millimeter-wavelength backscatter to p 34 A87-35518 surface snow properties WILLIAMS, VICKI L.

Identifying vegetable crops with Landsat Thematic Mapper data p 4 A87-35120

WILLIAMSON, H. D.

GLAI estimation using measurements of red, near infrared, and middle infrared radiance p.4 A87-35119

The effect of receiver amplifier non-linearity on ERS-1 synthetic aperture radar imagery p 52 N87-24755 WINKENBACH, H.

H. imaging spectrometer for measurements and Advanced color/fluorescence measurements further The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuel Forschung und Technologie (BMFT) Milestones in the development of an operational Earth Observation p 55 N87-24815 system

WINTER, R.

MIDAS - A new image-processing system for remote sensing p 37 A87-35183

WINTERBERGER, KENNETH C.

Comparison between digital and manual interpretation of high altitude aerial photographs p 48 A87-42257 WOLFE, ROBERT E.

Derivation of a fast algorithm to account for distortions due to terrain in earth-viewing satellite sensor images p 38 A87-35524

WOODCOCK, CURTIS E.

The factor of scale in remote sensing

p 39 A87-38096

WOODHOUSE, JOHN H.

Global images of the earth's interior p 15 A87-37918

WOODS, K. D.

New dimension analyses with error analysis for quaking aspen and black spruce

[NASA-TM-89219] WOODS, KERRY K.

Ten year change in forest succession and composition measured by remote sensing

p 11 N87-24735

I NASA-CR-180948 I p 11 N87-24736

WOODWARD, ROBERT H.

Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method

Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p 4 A87-33441

Investigation of simulated Monocular Electro-Optical Stereo Scanner (MEOSS)-imagery for sensor navigation p 54 N87-24771 and terrain derivation

WU. SHIH-TSENG

Multipolarization SAR data for surface feature delineation and forest vegetation characterization p 1 A87-31411

YANG, SHI-REN

The application of remote sensing techniques in China p 57 A87-41435

YANG, WEI-LIANG

A model for the use of satellite remote sensing for the measurement of primary production in the ocean

YENTSCH, CHARLES S.

The relationship between phytoplankton concentration and light attenuation in ocean waters p 29 A87-42642 YOSHIKADO, SHIN

Observation of precipitation from space by the weather p 44 A87-32507 radar

YOSHIMURA, MITSUNORI

A study of elevation measurement using LFC p 43 A87-32491 photograph

YOSHITOMI, SUSUMU

Marine Observation Satellite-1 (MOS-1)

p 20 A87-32499

YU. ZHENG

Image preprocessing for line detection based on local structure analysis p 39 A87-37801

YUWEI, WANG

Applied formulae for calibration of aerial hotogrammetric cameras p 51 N87-24744 photogrammetric cameras

Z

ZAMBRESKY, LIANA F.

The operational performance of the fleet numerical oceanography center global spectral ocean-wave mode p 24 A87-38832

ZHANG, LIXIA

High resolution sea surface temperature field derived

ZHOU, SISONG

High resolution sea surface temperature field derived p 33 N87-24731

ZIEMANN. H.

Proposed changes to the Canadian camera calibration p 53 N87-24757 Spectrophotometric measurements on color aerial p 55 N87-24798

ZIEMANN, HARTMUT

Thoughts on a standard algorithm for p 51 N87-24743 calibration The role of government specifications in aerial photography p 57 N87-24780

The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium Forschung und Technologie (BMFT) Milestones in the development of an operational Earth Observation

ZINI. ENRICO

Comparative evaluation and guide for the integrated utilization of LANDSAT (MSS and TM) and SPOT (HRV) satellites /k Hely sensed data [ETN-87-99-216]

ZWALLY, H. J.

Remote sensing as a research tool

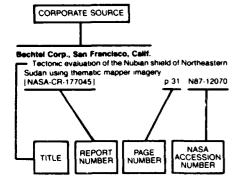
p 28 A87-40648

ZWALLY, H. JAY

Arctic Sea ice, 1973-1976. Satellite passive-microwave observations INASA-SP-4891 p 33 N87-24870

**B-11** 

# Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section . If applicable, a report number is also included as an aid in identifying

Admiralty Research Establishment, Portland (England). The SIR-8 mission: Towards an understanding of internal waves in the ocean

IARE-TR-861221 p 32 N87-23102

Air Force Geophysics Lab., Hanscom AFB, Mass. Atmospheric remote sensing in arctic regions

[AD-A179550] p 50 N87-23012

Air/Ocean Remote Sensing Co., San Diego, Calif Simulation of wind gradient errors in NROSS (Navy Remote Ocean Sensing System) radar scatterometer data in a simplified geometry

IAD-A1757541 p 49 N87-20642

Alaska Univ., Fairbanks.

Statistical description of the summertime ice edge in the Chukchi Sea, task 2 IDE87-0010561 p 31 N87-22387

Army Cold Regions Research and Engineering Lab., Hanover, N. H.

An evaluation of the polar ice prediction system [AD-A178522] p 41 N87-23014

Army Medical Research Inst. of Infectious Dise rt Detrick, Md

Detection of Rift Valley fever viral activity in Kenya by satellite remote sensing imagery p 7 A87-37827

Aster Consulting Associates, Inc., La Jolla, Calif. Inversion of canopy reflectance models for estimation of vegetation parameters (NASA-CR-181059) p 12 N87-24737

Atmospheric and Environmental Research, Inc., Cambridge, Mass.

Impact of satellite-based data on FGGE general irculation statistics p 44 A87-32985 circulation statistics

Bangladesh Space Research and Remote Sensing Organization, Dhaka.

Monsoon food boundary delineation and damage assessment using space borne imaging radar and Landsat p 35 A87-39467 data

Bayerische Akademie der Wissenschaften, Munich (West Germany).

Report on the Special Program 78 satellite geodesy of the Technical University of Munich [ASTRON-GEODAET-ARB-48] p 16 N87-20618

Bechtel National, Inc., San Francisco, Calif. Tectonic evaluation of the Nubian Shield of northeastern

Sudan using Thematic Mapper imagery p 19 N87-22319 [NASA-CR-180575]

Bercha (F. G.) and Associates Ltd., Calgary (Alberta). Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p 17 A87-31410

Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.

The relationship between phytoplankton concentration and light attenuation in ocean waters p 29 A87-42642 Bionetics Corp., Hampton, Va.

Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426

Boeing Aerospace Co., Seattle, Wash. NASA/MSFC large stretch press study

[NASA-CR-180376] p 41 N87-20554

Bonn Univ. (West Germany).

Geometrical system calibration, especially for metric p 51 N87-24745 aenal cameras

**Boston Univ., Mass** 

The factor of scale in remote sensing

p 39 A87-38096

# C

California Univ., Davis.

Polarized views of the earth from orbital altit

p 48 A87-42639

California Univ., La Jolla.

Remote sensing of chlorophyll concentrations in the northern Gulf of Mexico p 29 A87-42643 Coastal zone color scanner imagery of phytoplankton pigment distribution | Icelandic waters

p 29 A87-42645

California Univ., Santa Barbara.

The regression intersection method of adjusting image data for band ratioing p 45 A87-35306 Recent research in snow hydrology

p 35 A87-40309

Earth science research [NASA-CR-180512] p 11 N87-24733 New dimension analyses " or analysis for quaking

aspen and black spruce [NASA-TM-89219] p 11 N87-24735 Remote Sensing Information as Research Group Santa Barbara Information Scien. esearch Group, year

[NASA-CR-181073] p 43 N87-24817

Canada Centre for Remote Sensing, Ottawa (Ontario). Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies

p 8 A87-39187 The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager: Four years of operation

p 53 N87-24767 The use of auxiliary date in photogrammetric adjustments p 42 N87-24808

Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans

(France). Measurement and detection of precipitation. Satellite methous in the visible and the infrared

p 36 N87-22364 Energy Balance of the Tropical Systems (BEST): A space nent proposition

Centre de Recherches en Physique de

l'Environnement, Issy-les-Moulineaux (France). Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature

p 3 A87-33298

Centre National d'Études Spatiales, Toulouse (France). Remote sensing applications: Commercial issues and p 57 N87-20626 opportunities for space station p 42 N87-24804 SPOT image quality

Coastal Engineering Research Center, Vicksburg, Miss. DUCK '85 nearshore waves and currents experiment data summary report

IAD-A1774191 p 31 N87-22382

Colorado State Univ., Fort Collins.

The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data preliminary investigation p 35 A87-40249 Colorado Univ., Boulder.

Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431

Polar motion-induced gravity p 15 A87-36176

Comision Nacional de Investigaciones Espaciales,

Buenos Aires (Argentina).

Landsat classification of Argentina summer crops p3 A87-32098

# D

# Defense Mapping Agency Aerospace Center, St. Louis,

Preliminary results obtained by DMAAC from the processing of a limited set of GEOSAT satellite radar

[AD-A179081] p 50 N87-24734

Delaware Univ., Newark

Remote sensing of coastal wetlands

p 9 A87-40944 Real-time crop assessment using color theory and satellite data p 10 N87-20619

Department of Agriculture, Beltsville, Md.

Salinity effects on the microwave emission of soils p 5 A87-35520

Temporal observations of surface soil moisture using a passive microwave sensor p 7 A87-38094

Deutsche Forschungs- und Versuchsanstalt fuer Luftund Raumfahrt, Cologne (West Germany).

Application of Modular Optoelectronic Multispectral ner (MOMS) data to hydrology and vegetation studies. Test site: Pantanal Region (Brazil/Paraguay)

p 52 N87-24748 Deutsche Forschungs- und Versuchsanstalt fuer Luftund Raumfahrt, Oberpfaffenhofen (West Germany).

European utilization aspects studies p 49 N87-20624 Land panel report p 49 N87-20634

Comparative analysis of Thematic Mapper and SPOT image data for land use investigation p 51 N87-24746 Investigation of simulated Monocular Electro-Optical Stereo Scanner (MEOSS)-imagery for sensor navigation

and terrain derivation p 54 N87-24771 Exposure test with high resolution films from high p 54 N87-24775 altitude

Earth observation experiments on the German Spacelab The Monocular Electro-Optical Stereo Scanner (MEOSS) satellite experiment p 55 N87-24812 Modern CCD sensors and their applications in Earth

observation and planetary missions p 55 N87-24813
Deutsche Forschungs- und Versuchsanstalt füer Luftund Raumfahrt, Wesseling (West Germany).

Sunlight induced 685 nm fluorescence imagery p 30 A87-42646 Infrared Earth horizon sensor concepts in various p 52 N87-24752 spectral bands

Dornier-Werke G.m.b.H., Friedrichshafen (West

Germany).
The first ESA remote sensing satellite (status and

EG and G Washington Analytical Services Center, Inc., Pocomoke City, Md.

Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar

p 25 A87-38840

**European Centre for Medium-Range Weather** Forecasts, Reading (England).

The impact of initial conditions and SST Anomalies on extended range predictions for the El Nino period p 32 N87-23046

European Space Agency, Paris (France).

Proceedings of the European Symposium on Polar platform Opportunities and Remote-Sensing (ESPOIR) Instrumentation

Proceedings of the International Symposium on Progress in Imaging Sensors [ESA-SP-252] p 50 N87-24738

European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk

(Netherlands).

The Earth observation activities of the European Space Agency and the use of the polar platform of the p 49 N87-20622 International Space Station Definition of a thermal infrared pushbroom imager for Earth observation p 53 N87-24765

Firma Maps G.m.b.H., Munich (West Germany)

p 54 N87-24776 Very high resolution aerial films Florida Univ., Gainesville.

Comparison of HCMM and GOES satellite temperatures and evaluation of surface statistics p 39 A87-38098 Ford Motor Co., Dearborn, Mich.

OH measurement near the intertropical convergence p 21 A87-33430 zone in the Pacific

Freiburg Univ. (West Germany).

Comparative analysis of Thematic Mapper and SPOT image data for land use investigation p 51 N87-24746

G

General Software Corp., Landover, Md.

Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method p.8 A87-40248

Geological Survey, Flagstaff, Ariz.

Enhanced LANDSAT images of Antarctica and planetary exploration p 50 N87-23558

Geological Survey, Reston, Va.

Radar as a complement to topographic maps for delineating marine terraces [PB87-154597] p 41 N87-24013

Geological Survey of Canada, Ottawa (Ontario). Shuttle Imaging Radar (SIR-B) investigations of the

p 17 A87-31410 Canadian shield - Initial Report George Mason Univ., Fairfax, Va An assessment of Landsat MSS and TM data for urban

and near-urban land-cover digital classification p 13 A87-37280

Georgia Inst. of Tech., Atlanta.

Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean p 21 A87-33432

Houston Univ., Clear Lake, Tex.

Error analysis of leaf area estimates made from allometric regression models [NASA-TM-89220] p 11 N87-24010

Hunter Coll., New York.

The factor of scale in remote sensing

p 39 A87-38096

IBM France S. A., Paris.

Towards an automatic identification of urban textures p 14 N87-24747

Institut fuer Angewandte Geodaesie. Frankfurt am Main (West Germany).

Reports on cartography and geodesy, series 1, number

p 16 N87-22282 Reports on cartography and geodesy, series 1, number

[ISSN-0469-4236] p 16 N87-22286

The ViCOM system for digital image processing at the Institute of Cartography of Technical University, Hanover p 16 N87-22290

Institut Geographique National, Paris (France).

Applications of laser airborne telemetry at institut Geographique National (IGN), France

p 53 N87-24761

Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies Test site: Pantanal Region (Brazil/Paraguay)

p 52 N87-24748

International Council of Scientific Unions, Rome (Italy). Report of the workshop on Assimilation of Satellite Wind and Wave Data in Numerical Weather and Wave Prediction TWCP-1221

p 49 N87-21521

International Meteorological Inst., Stockholm (Sweden).

The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474 Istituto di Fisica dell Atmosfera, Rome (Italy).

Remotely sensed sea surface temperature for the Alpine Experiment (ALPEX) p 30 N87-21497

Jet Propulsion Lab., California Inst. of Tech., Pasadena.

Relating polarization phase difference of SAR signals to scene properties p 1 A87-31413

An assessment of Landsat MSS and TM data for urban and near-urban land-cover digital classification p 13 A87-37280

Spaceborne imaging radar research in the 1990s - An p 46 A87-38837 overview

The age and source of ocean swell observed in p 25 A87-38843 Hurricane Josephine Remote sensing as a research tool

p 28 A87-40648

GPS-based geodesy in California, Mexico and the Caribbean p 16 A87-41380 Rectification of terrain induced distortions in radar p 48 A87-42254 imagery The interaction of light with phytoplankton in the marine

p 29 A87-42640 environment A model for the use of satellite remote sensing for the measurement of primary production in the ocean p 29 A87-42644

Coastal zone color scanner imagery of phytoplankton pigment distribution in Icelandic waters

p 29 A87-42645 Optical image subtraction techniques, 1975-1985 p 40 A87-42659

The 1982-1983 El Nino Atlas: Nimbus-7 microwave radiometer data

[NASA-CR-180914] p 31 N87-22386 Earth surface sensing in the '90's p 51 N87-24739 Radiometric calibration of the Shuttle Imaging Radar p 53 N87-24756 (SIR-C) system

Johns Hopkins Univ., Laurel, Md.

Measuring ocean waves from space; Proceedings of the Symposium, Johns Hopkins University, Laurel, MD, Apr. 15-17, 1986 p 24 A87-38826 The age and source of ocean swell observed in Hurricane Josephine p 25 A87-38843

Spectrasat - A hybrid ROWS/SAR approach to monitor p 25 A87-38845 ocean waves from space

Joint Publications Research Service, Arlington, Va. Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during

p 31 N87-21980 Arianespace top performance benefits ESA p 57 N87-24493

High resolution sea surface temperature field derived p 33 N87-24731

Khartoum Univ. (Sudan).

narroum Univ. (Judean).
Optical and digital SAR processing techniques: A statistical comparison of accuracy using SEASAT imagery p 42 N87-24753

Lamont-Doherty Geological Inst., Palisades, N.Y.

Recurring polynyas over the Cosmonaut Sea and the p 23 A87-37563 Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

Polarized views of the earth from orbital altitude p 48 Ab7-42639

Los Alamos National Lab., N. Mex.

An atmospheric correction algorithm for remote identification of non-Lambertian surfaces and its range of

IDE87-0060591 n.41 NB7-24011 Modelling of atmospheric effects on the angular distribution of a backscattering peak

LDE87-0060601 D 41 N87-24014 Louisiana State Univ., Baton Rouge.

The integration of spectral and spatial analysis for land use classification

[AD-A178703] p 14 N87-23015 Utilizing remote sensing of thematic mapper data to improve our understanding of estuarine processes and their influence on the productivity of estuarine-dependent fisheries

[NASA-CR-180984] p 33 N87-24012 Ludwig-Maximilians-Universitaet, Munich (West

Germany).

Large Format Camera photographs of the Black Hills. USA, and their suitability for topographic and thematic mapping p 55 N87-24792

Marconi Co. Ltd., Great Baddow (England).

The effect of receiver amplifier non-linearity on ERS-1 p 52 N87-24755 synthetic aperture radar imagery arine Biological Lab., Woods Hole, Mass.

Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p 4 A87-33441

Maryland Univ., College Park.

Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern p 5 A87-35309

Canopy reflectance, photosynthesis, and transpiration. II - The role of biophysics in the linearity of their p 6 A87-37278 interdependence

Deriving surface albedo measurements from narrow band satellite data p 13 A87-39182

Comparison of North and South American biomes from AVHRR observations p 9 A87-40303

Massachusetts Inst. of Tech., Cambridge.

Radar scene generation for tactical decision aids p 40 N87-20449 NASA-CR-180234

Active and passive remote sensing of ice IAD-A1794611 D 32 N87-24009

Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768

Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn

(West Germany). Advanced imaging spectrometer for ocean measurements color/fluorescence and applications p 33 N87-24766

Meteorological Office, Bracknell (England). p 30 N87-20635 Ocean-ice panel report

Michigan Univ., Ann Arbor.

Relating polarization phase difference of SAR signals p 1 A87-31413 to scene properties Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies

p8 A87-39187 Evaluation of the airborne imaging spectrometer for

remote sensing of forest stand conditions [NASA-CR-180918] p p 10 N87-22296

Missouri Univ., Columbia.

IDOE/NBB-00771

A crop condition and crop yield estimation method based p 10 N87-22280 on NOAA/AVHRR satellite data

A review of national and international activities on modeling the effects of increased CO2 concentrations on the simulation of regional crop production: A report on linkage between climate and crop models

[DE87-005994] p 10 N87-22336 The impact of climate change from increased tmospheric carbon dioxide on American agriculture

p 11 N87-23032

N

National Aeronautics and Space Administration, Washington, D.C.

Carbon monoxide measurements over the eastern Pacific during GTE/CITE 1 p 21 A87-33435

Space remote sensors p 47 A87-40379 CORPORATE SOURCE National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide. oxide, and hydroxyl instrumentation p 45 A87-33426 Variations in the polarized leaf reflectance of Sorghum p 7 A87-38097 bicolor National Aeronautics and Space Administration Goddard Inst. for Space Studies, New York, N.Y. Deriving surface albedo measurements from narrow p 13 A87-39182 band satellite data Regional and seasonal variations of surface reflectance from satellite observations at 0.6 micron p 27 A87-40250 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p. 17 A87-31410 Signature-extendable technology - Global space-based crop recognition p 1 A87-31414 Continental land cover assessment using Landsat MSS p 3 A87-32095 Trace gas exchanges and transports over the Amazonian rain forest p 12 A87-32196 Impact of satellite-based data on FGGE general inculation statistics p 44 A87-32985 circulation statistics Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p 4 A87-33441 Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern Great Plains o 5 A87-35309 Salinity effects on the microwave emission of soils o.5 A87-35520 Creation of a global geodetic network using Mark III p 15 A87-36166 VLBI Computation of diffuse sky irradiance from multidirectional radiance measurements p 6 A87-37279 Interring spectral reflectances of plant elements by simple inversion of bidirectional measurements

nal reflectance p 7 A87-37281 Recurring polynyas over the Cosmonaut Sea and the p 23 A87-37563 Detection of Rift Valley fever viral activity in Kenya by atellite remote sensing imagery p.7. A87-37827 satellite remote sensing imagery Stochastic nature of Landsat MSS data p 46 A87-38093 Temporal observations of surface soil moisture using a passive microwave sensor

p 7 A87-38094 The physical basis for estimating wave-energy spectra with the radar ocean-wave spectrometer p 25 A87-38839

Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar

p 25 A87-38840 The Radar Ocean-Wave Spectrometer

p 25 A87-38846 Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies

A87-39187 Satellite detection of tropical burning in Brazil

p8 A87-39191 Thematic Mapper bandpass solar exoatmospheric irradiances p 40 A87-39192 Monitoring vegetation using Nimbus-7 scanning

mutichannel microwave radiometer's data D 8 A87-39194 Two-color short-pulse laser altimeter measurements of ocean surface backscatter p 27 A87-39462 Monsoon flood boundary defineation and damage assessment using space borne imaging radar and Landsat p 35 A87-39467 data

Concerning the relationship between evapotranspiration and soil moisture p8 A87-40244 Soil moisture estimation using GOES-VISSR infrared data - A case study with a simple statistical method

p8 A87-40248 Feedback between ice flow, barotropic flow, and baroclinic flow in the presence of bottom topography

D 27 A87-40289 Companson of North and South American biomes from

p 9 A87-40303 AVHRR observations Remote sensing as a research tool p 28 A87-40648

Reflectivity of earth's surface and clouds in ultraviolet p 47 A87-40768 from satellite observations Satellite sensing of aerosol absorption

p 47 A87-40770 Sunlight induced 685 nm fluorescence imagery p 30 A87-42646

Tidal estimation in the Atlantic and Indian Oceans, 3 dea x 3 dea solution

[NASA-TM-87812] p 30 N87-21534 Problems in merging Earth sensing satellite data sets [NASA-TM-87820] p 50 N87-22457 Quick-look guide to the crustal dynamics project's data

INASA-TM-878181 p 16 N87-23018 Spatial characterization of acid rain stress in Canadian Shield lakes

NASA-CR-1809831 p 36 N87-24031 Spatial characterization of acid rain stress in Canadian Shield lakes

NASA-CR-1809821 p 36 N87-24032 Ten year change in forest succession and composition measured by remote sensing

Arctic Sea ice, 1973-1976. Satellite passive-microwave observations

INASA-SP-4891 p 33 N87-24870

National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

Signature-extendable technology - Global space-based crop recognition 0.1 A87-31414 Landsat classification of Argentina summer crops

p 3 A87-32098 Polarized vicws of the earth from orbital altitude

p 48 A87-42639 Error analysis of leaf area estimates made from allometric regression models

NASA-TM-89220] New dimension analyses with error analysis for quaking aspen and black spruce [NASA-TM-89219] p 11 N87-24735

National Aeronautics and Space Administration.

Langley Research Center, Hampton, Va.

Trace gas exchanges and transports Amazonian rain forest p 12 A87-32196 Operational overview of NASA GTE/CITE 1 airborne instrument intercompansons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 OH measurement near the intertropical convergence p 21 A87-33430 zone in the Pacific Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean

p 21 A87-33431 Carbon monoxide measurements over the eastern Pacific during GTE/CITE 1 p 21 A87-33435 Airborne microwave Doppler measurements of ocean wave directional spectra p 26 A87-39180 Surface bidirectional reflectance properties of two southwestern Arizona deserts for wavelengths between 0.4 and 2.2 micrometers

INASA-TP-26431 p 49 N87-22281 National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis,

Multipolarization SAR data for surface feature delineation and forest vegetation characterization

p 1 A87-31411 Forest biomass, canopy structure, and species composition relationships with multipolarization L-band p 4 A87-35121 synthetic aperture radar data

Airborne remote sensing of forest biomes p 9 A87-40301

National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.

Trace gas exchanges and transports over p 12 A87-32196 Amazonian rain forest Operational overview of NASA GTE/CITE 1 airborne instrument intercomparisons - Carbon monoxide, nitric oxide, and hydroxyl instrumentation p 45 A87-33426 Wave-measurement capabilities of the surface contour radar and the airborne oceanographic lidar

p 25 A87-38840 National Aerospace Lab., Amsterdam (Netherlands). Foundations and applications of multispectral scanning n agriculture

(NLR-MP-85015-U) p 10 N87-21408 A modular and versatile acquisition, recording and preprocessing system for airborne remote sensing

p 52 N87-24751 National Center for Atmospheric Research, Boulder,

Measurements of nitric oxide in the boundary layer and

free troposphere over the Pacific Ocean p 21 A87-33431

National Marine Fisheries Service, Miami, Fla.

Utilizing remote sensing of thematic mapper data to mprove our understanding of estuarine processes and their influence on the productivity of estuanne-dependent fisheries

[NASA-CR-180984] p 33 N87-24012 National Oceanic and Atmospheric Administration, Seattle, Wash.

The age and source of ocean swell observed in Hurricane Josephine p 25 A87-38843

National Oceanic and Atmospheric Administration, Washington, D. C.

Satellite detection of tropical burning in Brazil n.8 A87-39191

Reflectivity of earth's surface and clouds in ultraviolet om satellite observations p.47. A87-40768 from satellite observations Coastal zone color scanner imagery of phytoplankton

pigment distribution in Icelandic waters

p 29 A87-42645 The AVHRR/HIRS operational method for satellite based sea surface temperature determination [NOAA-TR-NESDIS-28] p.31 n 31 N87-22388

National Research Council of Canada, Ottawa (Ontario).

Thoughts on a standard algorithm for camera p 51 N87-24743 calibration Proposed changes to the Canadian camera calibration nogen p 53 N87-24757 The role of government specifications in aenal p 57 N87-24780 photography Spectrophotometric measurements on color aerial 0 55

National Science Foundation, Washington, D.C. The interaction of light with phytoplankton in the marine p 29 A87-42640

Naval Ocean Research and Development Activity, Bay St. Louis, Miss.

Ocean wind and wave model comparisons with GEOSAT (GEOdesv SATellite) satellite data

AD-A1783021 p 33 N87-24061 Naval Postgraduate School, Monterey, Calif.

Laser reflectance as a function of rough water glitter

p 32 N87-23016 Naval Research Lab., Washington, D.C.

Airborne microwave Doppler measurements of ocean wave directional spectra p 26 A87-39180

Netherlands Organization for Applied Scientific Research TNO, Delft.

Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies A87-39187

New York State Univ., Binghamton.

Estimation of canopy parameters of row planted vegetation canopies using reflectance data for only four p 2 A87-32093 view directions

Ohio State Univ., Columbus.

Radial orbit error reduction and sea surface topography determination using satellite altimetry INASA-CR-1805701 p 33 N87-24816

Old Dominion Univ., Norfolk, Va.

Continental shelf processes affecting the oceanography of the South Atlantic Bight

I DE87-0053031 p 30 N87-20716 Ontario Centre for Remote Sensing, Toronto.

Shuttle Imaging Radar (SIR-B) investigations of the Canadian shield - Initial Report p 17 A87-31410 D 17 A87-31410 Open Univ., Milton (England).

Synergistic use of MOMS-01 and Landsat TM data p 46 A87-39190

Oregon State Univ., Corvallis.

Optical dynamics experiment (ODEX) data report R/V acania expedition 10 October-17 November 1982. Volume 2 Particle size distributions Volume 6 Scalar spectral-radiometer data IAD-A1785351 p 32 N87-23104

Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).

Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems

p 51 N87-24742

Purdue Univ., West Lafayette, Ind.

Continental land cover assessment using Landsat MSS p 3 A87-32095 Convective heating and precipitation estimates for the tropical South Pacific during FGGE, 10-18 January 1979 p 21 A87-32982

Variations in the polarized leaf reflectance of Sorghum p 7 A87-38097 bicolor

Regione del Veneto, Mestre-Venezia (Italy).

Comparative evaluation and guide for the integrated utilization of LANDSAT (MSS and TM) and SPOT (HRV) satellites remotely sensed data IETN-87-993561 p 41 N87-22278

Research Inst. of National Defence, Linkoeping

Potential of laser remote sensing of oil below water surface IFOA-C-30435-3.11 p 30 N87-20659

p 54 N87-24781

The RMK aenal camera system: Performance potential

of aerial photography with forward motion compensation

Zelss (Carl), Oberkochen (West Germany).

RMS Technologies, Inc., Landover, Md.

Monitoring vegetation using Nimbus-7 scanning mutichannel microwave radiometer's data p 8 A87-39194

Royal Australian Navy Research Lab., Edgecliff.

Studies of the east Australian current off northern New South Water

p 32 N87-23103 [AD-A178461] Royal Inst. of Tech., Stockholm (Sweden).

Image quality problems in practical aenal photography

S

Sen Diego State Univ., Calif.

Remotely-sensed tracers for hydrodynamic surface flow p 26 A87-39176 estimation

Sandia National Labs., Albuquerque, N. Mex. Measured radar return at the near vertical from forested

terrains IDE87-0093841

p 6 A87-37279

SAR, Inc., Lanham, Md.

Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p 4 A87-33441 SASC Technologies, Inc., Hyattsville, Md.

Concerning the relationship between evapotranspiration and soil moisture p8 A87-40244

SASC Technologies, Inc., Lanham, Md.

Stochastic nature of Landsat MSS data p 46 A87-38093

Science Applications international Corp., Washington, D.C.

Monitoring vegetation using Nimbus-7 scanning mutichannel microwave radiometer's data

p8 A87-39194 Science Applications Research, Lanham, Md.

Shuttle Imaging Radar (SIR-B) investigations of the p 17 A87-31410 Canadian shield - Initial Report Quantifying spatial and temporal variabilities of microwave brightness temperature over the U.S. Southern p 5 A87-35309

Computation of diffuse sky irradiance from multidirectional radiance measurements

Inferring spectral reflectances of plant elements by p 7 A87-37281 simple inversion of bidirectional measurements

Monsoon flood boundary delineation and damage assessment using space borne imaging radar and Landsat p 35 A87-39467

Reflectivity of earth's surface and clouds in ultraviolet p 47 A87-40768 from satellite observations

Scranton Univ., Pa.

Remote sensing of coastal wetlands

p 9 A87-40944 South Dakota School of Mines and Technology, Rapid

The area-time-integral technique to estimate convective rain volumes over areas applied to satellite data - A preliminary investigation p 35 A87-40249 Stuttgart Univ. (West Germany).

Smart sensors: An overview and selected examples

p 51 N87-24740 Improvement of image quality by forward motion

compensation, a preliminary report p 42 N87-24741 The use of camera orientation data in photogrammetry: p 52 N87-24749 A review

The effects of camera position and attitude data in aerial triangulation, a simulation study p 52 N87-24750 Application of Global Positioning System (GPS) receivers for Earth observation p 53 N87-24763

T

Technische Univ., Berlin (West Germany).

data Digital acquisition p 54 N87-24785 photogrammetry Technische Univ., Dresden (East Germany).

The production of photographs of the Earth's surface taken from satellites and their application in map production p 55 N87-24788 and map revision

Technische Univ., Hanover (West Germany).

Introduction of geometric information to radar image p 42 N87-24754

Aerial triangulation of CCD line-scanner images

p 54 N87-24769

Technische Univ., Munich (West Germany).

Large format camera image analysis for mapping of land use patterns in the region Noale - Musone, Po-River-Plain p 55 N87-24789 North Italy

The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuer Forschung und Technologie (BMFT). Milestones in the development of an operational Earth Observation p 55 N87-24815 system

Technische Univ., Vienna (Austria).

Photographic quality of color IR aerial photos as a function of atmospheric parameters p 42 N87-24799 Tel-Aviv Univ. (Israel).

Inferring spectral reflectances of plant elements by simple inversion of bidirectional nai reflectance p 7 A87-37281 measurements

Texas A&M Univ., College Station.

Remote sensing of chlorophyll concentrations in the northern Gulf of Mexico

Texas Univ., Austin.

Biharmonic spline interpolation of GEOS-3 and Seasat altimeter data p 20 A87-32770

Altimeter measurements for the determination of the Earth's gravity field INASA-CR-1805201 p 17 N87-23033

LANDSAT-based lineament analysis. East Texas Rasin. and structural history of the Sabine Uplift area, East Texas and North Louisiana [PB87-176327] p 19 N87-24043

Tokyo Univ. (Japan).

Earth Resources Satellite (ERS-1) project in Japan p 57 N87-24797

University of South Florida, St. Petersburg.

The interaction of light with phytoplankton in the marine p 29 A87-42640 environment

University of Southern California, Los Angeles.

A model for the use of satellite remote sensing for the

measurement of primary production in the ocean p 29 A87-42644

Virginia Univ., Charlottesville.

Trace gas exchanges and transports over Amazonian rain forest p 12 A87-32196

Wageningen Agricultural Univ. (Netherlands).

Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies p 8 A87-39187

Determination of spectral reflectance of crops during growth from calibrated multispectral small format aeric photography p 12 N87-24801

Washington Univ., Seattle.

The interaction of light with phytoplankton in the maril p 29 A87-42640 environment

Wayne State Univ., Detroit, Mich.

OH measurement near the intertropical convergence p 21 A87-33430 zone in the Pacific

Wild Heerbrugg Ltd. (Switzerland).

Wild Aviophot (TM) RC20 aerial camera system. The other approach to image motion compensation in aerial photography p 54 N87-24782

Wisconsin Univ., Madison.

A technique to estimate the ocean surface energy flux using VAS multispectral data p 30 N87-20710 Quick look Atlantic Ocean rain maps for gale

[NASA-CR-180511] p 30 N87-21533 Woods Hole Oceanographic Institution, Mass.

Deforestation in the tropics - New measurements in the Amazon Basin using Landsat and NOAA advanced very high resolution radiometer imagery p 4 A87-33441 CHART: A computer plotting package for the display of position-dependent marine data

[PB87-148607] p 31 N87-22297

World Climate Programme, Geneva (Switzerland).
Report of the workshop on Assimilation of Satellite Wind and Wave Data in Numerical Weather and Wave Prediction Models

[WCP-122] p 49 N87-21521

X

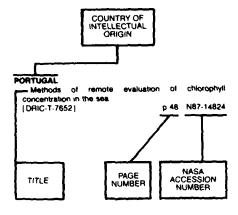
Xian Research Inst. of Surveying and Mapping (China). Applied formulae for calibration photogrammetric cameras p 5

p 51 N87-24744 On the matching of resolution in aerial photographic p 54 N87-24773

Estimating photogrammetric precision and cartographic p 42 N87-24791 potential of space imagery

p 42 N87-24804

# Typical Foreign Technology index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the citation in the abstract section.

# A

# AUSTRALIA

Habitat mapping by Landsat for aerial census of p 2 A87-32094 Australian utilization and research into remote sensing p 20 A87-32490 Coral reef remote sensing applications p 20 A87-32951 Some observations on crop profile modelling p 5 A87-35310 and their Mid-infrared remote sensing systems p 17 A87-35522 oplication to lithologic mapping Measurements on digitized hardcopy images p 39 A87-37290 A software defoliant for geological analysis of band p 18 A87-39193 Studies of the east Australian current off northern New [AD-A178461] p.32 N87-23103

# C

function of atmospheric parameters

Photographic quality of color IR aerial photos as a

p 42 N87-24799

# CANADA

On the relative accuracy of satellite and raingage rainfall measurements over middle latitudes during daylight hours p.34 A87-33295
Seasonal and regional variations of active/passive microwave signatures of sea ice p.22 A87-35516
Microwave sea-ice signatures near the onset of melt p.22 A87-35517
Mapping from space p.38 A87-35518
Radiometric correction of SAR images - A new correction algorithm p.40 A87-39184
Remote sensing of vegetation change near facc's Sudbury mining complexes p.8 A87-39198

Procedures for the description of agricultural crops and soils in optical and microwave remote sensing studies p.8 A87-39187 Radiometric comparison of the Landsat-5 TM and MSS p 47 A87-41432 Thoughts on a standard algorithm for camera p 51 N87-24743 calibration camera calibration p 53 N87-24757 Proposed changes to the Canadian report The Multidetector Electro-optical Imaging Sensor (MEIS) 2 pushbroom imager: Four years of operation p 53 N87-24767 The role of government specifications in aeria p 57 N87-24780 photography Spectrophotometric measurements on color aerial p 55 N87-24798 photographs photogrammetric The use of auxiliary date adjustments p 42 N87-24808 CHINA, PEOPLE'S REPUBLIC OF Exploration of geomagnetic field anomaly with balloo earch p 17 A87-32478 for geophysical re Predicting the location of kimberlite from a probability analysis of linear structure on remote sensing data p 18 A87-39186 The application of remote sensing techniques in China p 57 High resolution sea surface temperature field derived p 33 N87-24731 of p 51 N87-24744 photogrammetric cameras aerial photographic p 54 N87-24773 On the matching of resolution systems Estimating photogrammetric p p 42 N87-24791 potential of space imagery

# D

# DENMARK

A new covariance model for inertial gravimetry and gradiometry p 14 A87-31591

# F

# FINLAND

Applications of satellite microwave radiometry in Finland p 44 A87-32952 FRANCE VHF radar for ocean surface current and sas sate

remote sensing p 19 A67-31631
Evaluation of a surface/vegetation parameterization using satellite measurements of surface temperature p 3 A67-33296

Automatic classification of Pointe d'Arcay landscapes using Thematic Mapper data with the aid of a texturat analysis p 37 A87-35305 Introduction of initial centers for the algorithm of clustering around mobile centers p 37 A87-35313 A soil thermal model for remote sensing p 5 A87-35521

p 5 A87-35521
Sensors for imaging p 45 A87-36360
Fault patterns by space remote sensing and the rotation
of western Oregon during Cenozoic times

First results of lateritic cover mapping with SPOT images. The Kangaba region (South-Mali) p 18 A87-36925. Aircraft radiopositioning for airborne photography during hydrographic coastal surveys p 23 A87-36945. Reconnaissance of vegetal formations in a Guinean forest sector by means of Landsat images.

p.6 A87-36946 Image preprocessing for line detection based on local structure analysis The Geomylis database management system

Multisatellite data processing p 39 A87-37802
Nadir looking airborne radar and possible applications to forestry p 7 A87-38095
Spacelab data - A new contribution for structural interpretations of remotely sensed data in geology p 18 A87-39790

Satellite estimation of a solar irradiance at the surface of the earth and of surface albedo using a physical model applied to Meteosat data p 47 A87-40246 applied to Meteosat data Proceedings of the European Symposium on Polar platform Opportunities Remote-Sensing (ESPOIR) and Instrumentation (ESA-SP-266) Remote sensing applications: Commercial issues and opportunities for space station p 57 N87-20626 Measurement and detection of precipitation. Satellite methods in the visible and the infrared p 36 N87-22364 Energy Balance of the Tropical Systems (BEST): A space p 36 N87-22373 Proceedings of the International Symposium on Progress in Imaging Sensors [ESA-SP-252] o 50 N87-24738 Towards an automatic identification of urban texture p 14 N87-24747 Applications of laser airborne telemetry at Institut Geographique National (IGN), France p 53 N87-24761

# G

## GERMANY, FEDERAL REPUBLIC OF

SPOT image quality

Scientific goals and technical limitations of the shuttleborne synthetic aperture experiment X-SAR p. 44 A87-32505

Observations of intermittent cumulus convection in the boundary layer p. 20 A87-32976

MIDAS - A new image-processing system for remote

MIDAS - A new image-processing system for remote sensing p 37 A87-35183 Stereoscopic line scan imaging and satellite control [DGLR PAPER 86-106] p 38 A87-36757 Comparison of satellite-derived sea surface temperatures with in situ skin measurements

Strategies and technologies for monitoring the environment p 14 A87-39593
Report on the Special Program 78 satellite geodesy of the Technical University of Munich
[ASTRON-GEODAET-ARB-48] p 16 N87-20618

p 49 N87-20624 Land panel report p 49 N87-20634 Reports on cartography and geodesy, series 1, number 96

European utilization aspects studies

[ISSN-0469-4236] p 16 N87-22282 Reports on cartography and geodesy, series 1, number 97

[ISSN-0469-4236] p 16 N87-22286 The VICOM system for digital image processing at the Institute of Cartography of Technical University, Hanover (West Germany) p 16 N87-22290 Arianespace top performance benefits ESA

p 57 N87-24493 Smart sensors: An overview and selected examples p 51 N87-24740

Improvement of image quality by forward motion compensation, a preliminary report p 42 N87-24741 Optical Transfer Function (OTF)-based quality criteria for aerial cameras and imaging systems

p 51 N87-24742
Geometrical system calibration, especially for metric
aerial cameras p 51 N87-24745
Comparative analysis of Thematic Manoper and SPOT

image data for land use investigation p.51 N87-24746 Application of Modular Optoelectronic Multispectral Scanner (MOMS) data to hydrology and vegetation studies. Test site: Pantanal Region (Brazil/Paraguay)

p 52 N87-24748

The use of camera orientation data in photogrammetry:
A review p52 N87-24749
The effects of camera position and attitude data in aerial triangulation, a simulation study p52 N87-24750
Infrared Earth horizon sensor concepts in various spectral bands p52 N87-24752
Introduction of geometric information to radar image data p42 N87-24754

Application of Global Positioning System (GPS) receivers for Earth observation p 53 N87-24763 Advanced imaging spectrometer for ocean measurements p 33 N87-24766 applications The stereo pushbroom scanner system Digital Photogrammetry System (DPS) and its accuracy p 53 N87-24768 Aerial triangulation of CCD line-scanner images p 54 N87-24769 Investigation of simulated Monocular Electro-Optical Stereo Scanner (MEOSS)-imagery for sensor navigation p 54 N87-24771 and terrain derivation Exposure test with high resolution films from high altitude p 54 N87-24775 Very high resolution aenal films p 54 N87-24776 The first ESA remote sensing satellite (status and outlook) p 57 N87-24777 The RMK aerial camera system: Performance potential of aerial photography with forward motion compensation p 54 N87-24781 Digital data for close-range acquisition p 54 N87-24785 photogrammetry The production of photographs of the Earth's surface taken from satellites and their application in map production and map revision p 55 N87-24788 Large format camera image analysis for mapping of land se patterns in the region Noale - Musone, Po-Riv North Italy p 55 N87-24789 Large Format Camera photographs of the Black Hills, USA, and their suitability for topographic and thematic mapping p 55 N87-24792 Earth observation experiments on the German Spacelab mission D2 p 55 N87-24811 Stereo Scanner The Monocular Electro-Optical p 55 N87-24812 (MEOSS) satellite experiment Modern CCD sensors and their applications in Earth p 55 N87-24813 observation and planetary missions The Modular Optoelectronic Multispectral Scanner (MOMS) program of the Bundesministerium fuer Forschung und Technologie (BMFT). Milestones in the development of an operational Earth Observation system p 55 N87-24815 GERMANY, PEOPLES DEMOCRATIC REPUBLIC OF Investigation of tectonic deformations using global atellite laser ranging data p 14 A87-33375 satellite laser ranging data HUNGARY Remote sensing methods of yield forecasting p 2 A87-32009 The application of remote sensing in agricultural

meteorology at the Meteorological Service of the HPR

p 2 A87-32010 Surface models including direct cross-radiation simple model of furrowed surfaces p 40 A87-39189

# INDIA

Indian remote sensing programme p 56 A87-32955 Geochronological studies of strandlines of Saurashtra, India, detected by remote sensing techniques

p 15 A87-35308 Determination of the velocity of ocean gyres through Synthetic Aperture Radar p 22 A87-35314 Data Compression System for video images

p 46 A87-37421 Montane vegetation stratification through digital p 9 A87-40302 processing of Landsat MSS data

A soil map through Landsat satellite imagery in a part of the Auranga catchment in the Ranchi and Palamou districts of Bihar, India p 9 A87-41428

Rice crop identification and area estimation using remotely-sensed data from Indian cropping patterns p 9 A87-41434

# INTERNATIONAL ORGANIZATION

A curious sea-surface-temperature observed by Meteosat p p 19 A87-31572 Workshop on Space Remote Sensing for Agricultural and Thematic Mapping, Budapest, Hungary, Apr. 18, 1986, **Proceedings** p 1 A87-32007 Intelsat's small earth stations - Impact on the developing orld p.56 A87-34799 AVHRR data services in Europe - The Earthnet world p 39 A87-37922 The operational performance of the fleet numerical oceanography center global spectral ocean-wave model

# ITALY

Balloon-borne infrared multichannel radiometer for remote sensing of high resolution low-level water vapo fields p 43 A87-32477

p 24 A87-38832

Development of a satellite remote sensing technique or the study of alpine glaciers p 34 A87-35311 for the study of alpine glaciers The Tethered Satellite System as a new remote sensing platform p 46 A87-39183 Remotely sensed sea surface temperature for the Alpine xperiment (ALPEX) p 30 N87-21497 Comparative evaluation and guide for the integrated Experiment (ALPEX) utilization of LANDSAT (MSS and TM) and SPOT (HRV) satellites remotely sensed data IETN-87-993561 p 41 N87-22278

### JAPAN

Earth rotation. station coordinates and orbit determination from satellite laser ranging

43 A87-32349 Spectral classification of Landsat-5 Thematic Mapper p 37 A87-32488 Correction for atmospheric and topographic effects on p 37 A87-32489 the Landsat MSS data study of elevation measurement using LFC photograph p 43 A87-32491 Estimation of roughness of the earth's surface using Landsat MSS data on the assumption of reciprocity or

light scattering p 12 A87-32493 Landcover change in Hiroshima during 1979/1984 detected by Landsat MSS and TM data

p 12 A87-32494 Global vegetation monitoring using NOAA vegetation p 3 A87-32495 Fundamental study on systematization of selecting new

development area with Landsat data and topographic p 12 A87-32496 informations Monitoring of snow and ice in Hokkaido Island using p 20 A87-32497 multitemporal NOAA-AVHRR data

Relation between precipitation and brightness of earth surface in the NOAA/GVIP data p 3 A87-32498 Marine Observation Satellite-1 (MOS-1)

p 20 A87-32499 Airborne observation experiments for MOS-1 verification p 44 A87-32500 program (MVP) Earth resources satellite-1 (ERS-1) p 44 A87-32501 The French Space Oceanography Program

p 20 A87-32503 Simulation software of synthetic aperture radar

p 37 A87-32506 Observation of precipitation from space by the weather p 44 A87-32507 World-wide weather p 56 A87-33125 radar

Sea surface temperature measurement from space allowing for the effect of the stratospheric aerosols p 22 A87-35148

Atmospheric environment monitoring system based on an earth-to-satellite Hadamard transform laser long-path absorption spectrometer - A proposal p 45 A87-35502

The dependence of sea-surface microwave emission on wind speed, frequency, incidence angle, and polarization over the frequency range from 1 to 40 GHz

p 22 A87-35515 Earth Resources Satellite (ERS-1) project in Japan p 57 N87-24797

# NETHERLANDS

The Netherlands-Indonesian remote-sensing satellite p 43 A87-32210 An application of low altitude multispectral photography p 6 A87-37054 to agricultural field trials What, where, when ..., why? Extracting information from p 46 A87-37055 remote sensing data Recent results with a third-generation ocean-wave model p 24 A87-38833 The Earth observation activities of the European Space

Agency and the use of the polar platform of the International Space Station p 49 N87-20622 Foundations and applications of multispectral scanning

in agriculture [NLR-MP-85015-U] p 10 N87-21408

A modular and versatile acquisition, recording and preprocessing system for airborne remote sensing p 52 N87-24751

Definition of a thermal infrared pushbroom imager for p 53 N87-24765 Earth observation

Determination of spectral reflectance of crops during growth from calibrated multispectral small format aerial photography p 12 N87-24801 photography NIGERIA

Reflectance characteristics and its application in the classification of Nigerian Savanna soils

p.3 A87-32954

### NORWAY

Ice-edge eddies in the Fram Strait marginal ice zone p 27 A87-40432

### SOUTH AFRICA, REPUBLIC OF

Landsat as an aid in evaluating the adequacy of a grain silo network A87-37282

### SPAIN

Analysis of moderate and intense rainfall rates continuously recorded over half a century and influence on microwave communications planning and rain-rate data acquisition p 46 A87-36933

Optical and digital SAR processing techniques. A statistical companion of accuracy using SEASAT imagery p 42 N87-24753

Influence of different nitrogen and irrigation treatments on the spectral reflectance of barley p 2 A87-32090 The topographic effect on Landsat data in gently undulating terrain in southern Sweden p 4 A87-35307 Potential of laser remote sensing of oil below water

IFOA-C-30435-3.11 p 30 N87-20659 The observational objectives and the implementation of the Global Weather Experiment p 49 N87-21474 Image quality problems in practical aerial photography

### SWITZERLAND

Using the Global Positioning System (GPS) for high precision geodetic surveys - Highlights and problem p 16 A87-41383 Report of the workshop on Assimilation of Satellite Wind

and Wave Data in Numerical Weather and Wave Prediction Models IWCP-1221 p 49 N87-21521

## U.S.S.R.

The determination of earth-rotation parameters from satellite laser ranging p 15 A87-34186

Optimization of a program of experiments in connection with the operational planning of studies carried out with p 56 A87-34208

Remote-sensing method for determining monthly precipitation sums using Meteor-satellite data on the p 21 A87-34447

Rapid analysis of satellite radar images of sea ice p 22 A87-35873

Problems in the automation of map-compilation processes on the basis of remote-sensing data

p 38 A87-35925 Use of satellite altimetry for ocean monitoring

p 23 A87-36101 Cloud-cover and precipitation patterns over the Republic of Guinea according to ground-based and satellite observations p 35 A87-36102

Surface manifestations of hydrophysical processes in the Strait of Gibraltar according g to 'Salyut-6' p 35 A87-36103 photographs The geometry of the intersections of tectonic structures

detected on satellite images p 17 A87-36104 The geostructural characteristics of the rift zone on the Lambert glacier (Antarctica) according to space images p 18 A87-36105

Satellite techniques for studying ice crusts and underground waters in the eastern Pamir

p 35 A87-36106 Measurement of the spatial spectrum of ocean waves using a two-frequency scatterometer p 23 A87-36107 Statistical evaluation of forest characteristics from aerial and space photographs p 5 A87-36109

The possibility of using satellite measurements of methane in the atmosphere to study the global-distribution p 13 A87-36125 characteristics of its sources Environmental protection from space

p 13 A87-36363 Aerial and space investigations of soils and vegetation p 6 A87-36579

Phase portraits of vegetation development trajectories in a multidimensional spectral attribute space

p 10 A87-41771 Physical principles of image convergence in remote

p 40 A87-41925 Possibilities of using artificial Earth satellite data for computing heat exchange between the ocean and atmosphere in Newfoundland energy-active zone during p 31 N87-21980

GLAI estimation using measurements of red, near infrared, and middle infrared radiance p 4 A87-35119

A comparison of supervised maximum likelihood and decision tree classification for crop cover estimation from multitemporal Landsat MSS data p 5 A87-35312 p 5 A87-35312 Landsat image enhancement study of possible submerged sand-dunes in the Arabian Gulf p 22 A87-35315 The relation of millimeter-wavelength backscatter to p 34 A87-35518 surface snow properties p 34 A87-35518 GINFEST - Geodetic intercomparison network for evaluating space techniques p 15 A87-36164
Remote sensing - Handling the data p 38 A87-36359

Landform investigation utilizing digitally processed satellite Thematic Mapper imagery p 38 A87-36546

A two-look technique for studying atmospheric effects in optical scanner data for the ocean p 26 A87-39178 in optical scanner data for the ocean per per No. 1976

The effect of a non-Gaussian point target response function on radar altimeter returns from the sea surface p. 26. A87-39179

Synergistic use of MOMS-01 and Landsat TM data. p 46 A87-39190 The propagation of short surface waves on longer gravity waves p 28 A87-40835
Multilook images of ocean waves by synthetic aperture radars
A polar platform for the remote sensing needs of ecology
and agriculture - A view from the U.K. p 9
A87-41430
Ocean-ice panel report p 30
N87-20635 Ocean-ice panel report p 30 N87-20635
The impact of initial conditions and SST Anomalies on extended range predictions for the El Nino period p 32 N87-23046 The SIR-B mission: Towards an understanding of internal waves in the ocean p 32 N87-23102 [ARE-TR-86122] The effect of receiver amplifier non-linearity on ERS-1 ynthetic aperture radar imagery p 52 N87-24755 synthetic aperture radar imagery

# **CONTRACT NUMBER INDEX**

RTH RESOURCES / A Continuing Bibliography (Issue 55)

**NOVEMBER 1987** 

# Typical Contract Number Index Listing



Listings in this index are arranged alpha-numerically by contract number. Under each contract number, the assession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the AIAA accession numbers appearing first. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

CEC-CLI-083-F	p 28	A87-40434
CNEXO-84/3147	p 28	A87-40434
CNRS-981-022	p 28	A87-40434
DAAG29-82-K-0189	p 14	N87-23015
DE-AC02-83ER-60182	p 18	A87-39468
DE-AC04-76DP-00789	p 11	N87-24593
DE-AC05-84OR-21400	p 4	A87-33441 A87-42256
DE-AC09-76SR-00001 DE-AC09-76SR-00819	p 36	A87-42256 A87-42256
	p 36	N87-22387
DE-AC21-83MC-20037 DE-FG02-86ER-60444	р 31 р 10	N87-22336
DE-FG02-86ER-60444 DE-FG05-85ER-60348	p 30	N87-20716
F33615-83-C-1071	p 45	A87-35344
GRI-5082-211-0708	p 19	N87-24043
JPL-956578	p 10	N87-22296
MOD(PE)-NUW-72A/1287	p 32	N87-23102
MOESC-60129032	p 32	A87-32488
NAGW-374	p 9	A87-40944
NAGW-455	p 45	A87-35306
NAGW-455	p 43	N87-24817
NAGW-465	p 29	A87-42640
NAG1-50	p 21	A87-33432
NAG5-177	p 45	A87-35306
NAG5-184	p 3	A87-33298
NAG5-269	p 7	A87-38097
NAG5-386	p 35	A87-40249
NAG5-492	p 6	A87-37278
NAG5-519	p 33	N87-24816
NAG5-548	p 11	N87-24010
	p 11	N87-24733
	p 11	N87-24736
NAG5-742	p 30	N87-21533
NAG5-746	p 17	N87-23033
NAG5-769	p 40	N87-20449
NAG5-787	p 20	A87-32770
NAG6-17	p 29	A87-42642
NASA ORDER L-200080	p 39	A87-38096
NASA ORDER S-56107-D	p 33	N87-24012
NAS2-8759	p 46	A87-39190
NAS5-22966	p 29	A87-42643
NAS5-26453	p 39	A87-38098
NAS5-26515	p 44	A87-32985
NAS5-27644	p 15	A87-36176
NAS5-27745	p 44	A87-32985
NAS5-28200	p 6	A87-37279
	p 7	A87-37281
NAS5-28757	p 19	N87-22319
NAS5-28770	p 35	A87-40309
NAS5-28779	p 36	N87-24031
	p 36	N87-24032
NAS5-29472	p 12	N87-24737
THOUSE	P 12	1407-24707

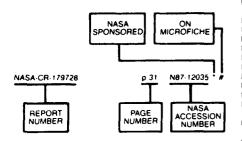
NAS7-918	p 13	A87-37280
NAS8-35187	p 21	A87-32982
NAS8-35969	p 41	N87-20554
NAS9-16528	p 7	A87-37281
NAS9-16664	p 39	A87-38096
NATO-27-0523/85	p 24	A87-38833
NATO-320/82	p 14	A87-31591
NCC1-95	p 12	A87-32196
NCC5-20	p 13	A87-39182
NCC5-26	ρ9	A87-40303
NERC-GR/3/5096	p 4	A87-35119
NERC-P60/G6/16	р9	A87-41430
NOAA-NA-81AAD0095	p 14	A87-42255
NOAA-NA-84AAH00026	p 47	A87-40756
NOAA-NA-85AADSG033	p 9	A87-40944
NOAA-04/M01-B4	p 14	A87-42255
NSERC-A-5252	p 47	A87-41432
NSERC-A-8643	p 47	A87-41432
NSF ATM-84-05748	p 21	A87-32982
NSF CEE-82-10857	p 19	A87-32097
NSF DAR-80-17836	p 9	A87-40944
NSF DPP-81-20332	p 19	A87-31592
NSF DPP-84-12404	p 19	A87-31592
NSF DPP-85-02386	p 23	A87-37563
NSF EAR-81-20944	p 15	A87-37918
NSF EAR-82-13330	p 15	A87-37918
NSF EAR-83-17594	p 15	A87-37918
	p 15	A87-37918
	p 15	A87-37918
		A87-32953
NSF SES-81-12797	p 12	A87-40434
N00014-76-C-0004	p 28	
N00014-81-C-0043	p 29	A87-42642 A87-37886
N00014-81-C-0062	p 24	
N00014-81-C-0295	p 27	A87-40433
N00014-83-C-0404	p 27	A87-40433
N00014-83-K-0020	p 28	A87-40434
N00014-83-K-0258	p 32	N87-24009
N00014-84-C-0111	p 29	A87-42640
N00014-84-C-0132	p 28	A87-40434
N00014-84-C-0134	p 24	A87-37886
N00014-84-C-0218	p 32	N87-23104
N62271-86-M-0235	p 49	N87-20642
USDA-58-319T-3-0Z08X	p 4	A87-35120
USDA-58-319T-40238X	p 47	A87-39457
W-7405-ENG-36	p 41	N87-24011
	p 41	N87-24014
W-7405-ENG-48	p 11	N87-23032
672-40-04-70	p 49	N87-22281

# REPORT NUMBER INDEX

**EARTH RESOURCES** / A Continuing Bibliography (Issue 55)

**NOVEMBER 1987** 

# Typical Report Number Index Listing



Listings in this index are arranged alph-numerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (\*) indicates that the item is a NASA report. A pound sign (\*) indicates that the item is available on microfiche.

ACCN-74513	p 32	N87-23102	#
AD-A175754	p 49	N87-20642	#
AD-A177419	p 31	N87-22382	#
AD-A178302	p 33	N87-24061	#
AD-A178461	p 32	N87-23103	#
AD-A178522	p 41	N87-23014	#
AD-A178535	p 32	N87-23104	#
AD-A178703	p 14	N87-23015	#
AD-A178774		N87-23016	#
AD-A179081		N87-24734	#
AD-A179461	p 32	N87-24009	#
AD-A179550	p 50	N87-23012	#
AFGL-TR-87-0128	p 50	N87-23012	#
AO1-1(ST1)	p 49	N87-20642	#
ARE-TR-86122	p 32	N87-23102	#
ARO-19327.9-GS	p 14	N87-23015	#
ASTRON-GEODAET-ARB-48	p 16	N87-20618	#
BR101469	p 32	N87-23102	#
CERC-MP-87-3	p 31	N87-22382	#
CONF-870576-1	p 41	N87-24014	#
CONF-870576-2	p 41	N87-24011	#
DATA-124-VOL-2/6	p 32	N87-23104	#
DE87-001056	p 31	N87-22387	#
DE87-005303	p 30	N87-20716	#
DE87-005994		N87-22336	#
DE87-006059		N87-24011	#
DE87-006060		N87-24014	#
DE87-009384	p 11	N87-24593	#
DGLR PAPER 86-106	p 38	A87-36757	#
DOE/ER-60348/5	p 30	N87-20716	#
DOE/ER-60444/T1	p 10	N87-22336	#
DOE/MC-20037/2265	p 31	N87-22387	#
DOE/NBB-0077	p 11	N87-23032	#
D180-27884-3	p 41	N87-20554 *	#
ERIM-189400-21-L	p 36	N87-24032 *	
ERIM-198400-19-L	p 36	N87-24031 °	#

ESA-SP-252 ...... p 50 N87-24738 #

ECA CD DEC	- 40	NO7 20004 #
ESA-SP-266	p 48	N87-20621 #
ETN-87-98974	p 16	N87-20618 #
ETN-87-99183		N87-21521
ETN-87-99283ETN-87-99328		N87-21408 # N87-22282 #
ETN-87-99329		N87-22286 #
ETN-87-99356		N87-22278 #
ETN-87-99434		N87-20621 #
ETN-87-99441	p 30	N87-20659 #
ETN-87-99809		N87-23102 # N87-24738 #
	F	
FOA-C-30435-3.1	p 30	N87-20659 #
GRI-87/0077	p 19	N87-24043 #
ISBN-3-7696-9791-X	p 16	N87-20618 #
ISSN-0340-7691		N87-20618 #
ISSN-0347-3708	•	N87-20659 #
ISSN-0379-6566		N87-20621 # N87-24738 #
ISSN-0469-4236		N87-22282 #
ISSN-0469-4236	p 16	N87-22286 #
JPL-PUB-87-5	p 31	N87-22386 * #
JPL-9950-1281	p 10	N87-22296 * #
L-16159	p 49	N87-22281 * #
LA-UR-87-571		N87-24011 # N87-24014 #
LC-86-23876	p 33	N87-24870 * #
NAS 1.15:87812	p 30	N87-21534 * #
NAS 1.15:87818	p 16	N87-23018 * #
NAS 1.15:87820		N87-22457 * #
NAS 1.15:89219NAS 1.15:89220		N87-24735 * # N87-24010 * #
NAS 1.21:489		N87-24870 * #
NAS 1.26:180234	p 40	N87-20449 * #
NAS 1.26:180376		N87-20554 * #
NAS 1.26:180511NAS 1.26:180512		N87-21533 * # N87-24733 * #
NAS 1.26:180520		N87-23033 * #
NAS 1.26:180570		N87-24816 * #
NAS 1.26:180575		N87-22319 * #
NAS 1.26:180914NAS 1.26:180918		N87-22386 * # N87-22296 * #
NAS 1.26:180948		N87-24736 * #
NAS 1.26:180982	p 36	N87-24032 * #
NAS 1.26:180983		N87-24031 * #
NAS 1.26:180984 NAS 1.26:181059		N87-24012 * # N87-24737 * #
NAS 1.26:181073		N87-24817 * #
NAS 1.60:2643		N87-22281 * #
NASA-CR-180234	p 40	N87-20449 * #
NASA-CR-180376	p 41	N87-20554 * #
NASA-CR-180511 NASA-CR-180512		N87-21533 * #
NASA-CR-180512 NASA-CR-180520		N87-24733 * # N87-23033 * #
NASA-CR-180570		N87-24816 * #
NASA-CR-180575		N87-22319 * #
NASA-CR-180914		N87-22386 * #
NASA-CR-180918 NASA-CR-180948		N87-22296 * # N87-24736 * #
NASA-CR-180982		N87-24032 * #
NASA-CR-180983		N87-24031 * #
NASA-CR-180984 NASA-CR-181059		N87-24012 * # N87-24737 * #
NASA-CR-181073	p 12 p 43	N87-24737 * # N87-24817 * #
NASA-SP-489		N87-24870 * #
NASA-TM-87812	O 30	N87-21534 * #
NASA-TM-87818	•	N87-23018 * #
NASA-TM-87820		N87-22457 * #
NASA-TM-89219		N87-24735 * #
NASA-TM-89220		N87-24010 ° #

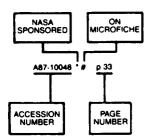
NASA-TF-2643	p 49	N87-22281 * #
NEPRF-CR-86-05	p 49	N87-20642 #
NLR-MP-85015-U	p 10	N87-21408 #
NOAA-TR-NESDIS-28	p 31	N87-22388 #
NORDA-168	p 33	N87-24061 #
PB87-148607	p 31	N87-22297 #
PB87-154597	D 41	N87-24013 #
PB87-176327	p 19	N87-24043 #
RANRL-TN-6/86	p 32	N87-23103 #
REF-86-10-VOL-2/6	p 32	N87-23104 #
REPT-377	р 33	N87-24816 * #
REPT-87B0163	20 מ	N87-21534 * #
REPT-8780275	p 50	N87-22457 * #
SAND-86-2618	p 11	N87-24593 #
SAPR-4	p 33	N87-24012 * #
SPIE-637	p 28	A87-42637 #
USGS/OFR-86/010	p 41	N87-24013 #
WCP-122	p 49	N87-21521
WHOI-86-43	p 31	N87-22297 #
WMO-TD-148	p 49	N87-21521

# **ACCESSION NUMBER INDEX**

EARTH RESOURCES / A Continuing Bibliography (Issue 55)

**NOVEMBER 1987** 

# **Typical Accession Number Index Listing**



Listings in this index are arranged alpha-numerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (\*) indicates the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A87-31409 #	p 34	A87-33125 #	p 56
A87-31410 *#	p 17	A87-33292 #	p 13
A87-31411 *#	p 1	A87-33295 #	p 34
A87-31412 #	p 36	A87-33297 #	p 34
A87-31413 *#	p 1	A87-33298 * #	р3
A87-31414 *#	p.1	A87-33375 #	p 14
A87-31572 #	p 19	A87-33426 *#	p 45
A87-31591 #	p 14	A87-33430 *#	p 21
A87-31592 #	p 19	A87-33431 *#	p 21
A87-31631 #	p 19	A87-33432 *#	p 21
A87-32007 #	p 1	A87-33435 *#	p 21
A87-32008 #	p 2	A87-33441 °#	p 4
A87-32009 #	p 2	A87-34186 # A87-34208 #	p 15
A87-32010 #	p 2		p 56
A87-32090 #	p 2		p 21
A87-32091 #	p 2		p 56
A87-32092 #	p 34	A87-34799 # A87-35119 #	p 56
A87-32093 * #	p 2		p 4 p 4
A87-32094 #	0.2	A87-35120 # A87-35121 #	
A87-32095 *#	p 3	A87-35121 # A87-35122 #	р4 р4
A87-32097 #	p 19	A87-35122 # A87-35148 #	p 22
A87-32098 * #	p 3	A87-35183 #	p 37
A87-32196 * #	p 12	A87-35305 #	p 37
A87-32210 #	p 43	A87-35305 #	p 45
A87-32349 #	p 43	A87-35300 #	p 4
A87-32477 #	p 43	A87-35308 #	p 15
A87-32478 #	p 17	A87-35309 * #	p 5
A87-32488 #	p 37	A87-35310 #	p 5
A87-32489 #	p 37	A87-35311 #	p 34
A87-32490 #	p 20	A87-35312 #	p 5
A87-32491 #	p 43	A87-35313 #	p 37
A87-32493 #	p 12	A87-35314 #	p 22
A87-32494 #	p 12	A87-35315 #	p 22
A87-32495 #	p 3	A87-35344 #	p 45
A87-32496 #	p 12	A87-35502 #	p 45
A87-32497 #	p 20	A87-35515 #	D 22
A87-32498 #	p 3	A87-35516 #	p 22
A87-32499 #	p 20	A87-35517 #	D 22
A87-32500 #	p 44	A87-35518 #	p 34
A87-32501 #	p 44	A87-35520 * #	p 5
A87-32502 #	p 56	A87-35521 #	p 5
A87-32503 #	p 20	A87-35522 #	p 17
A87-32505 #	p 44	A87-35523 #	p 13
A87-32506 #	p 37	A87-35524 #	p 38
A87-32507 #	p 44	A87-35873 #	p 22
A87-32770 * #	p 20	A87-35925 #	p 38
A87-32951 #	p 20	A87-36101 #	p 23
A87-32952 #	p 44	A87-36102 #	p 35
A87-32953 #	p 12	A87-36103 #	p 35
A87-32954 # A87-32955 #	p 3	A87-36104 #	p 17
	p 56	A87-36105 #	p 18
A87-32976 # A87-32982 *#	p 20	A87-36106 #	p 35
A87-32985 * #	p 21	A87-36107 #	p 23
A87-33122 #	p 44 p 45	A87-36107 #	p 23
MOTOSTEE #	p 73	701-30108 #	ρo

A87-36125 #	p 13
A87-36126 #	p 15
A87-36164 #	
	p 15
A87-36166 *#	p 15
A87-36176 *#	p 15
A87-36359 #	p 38
A87-36360 #	
A67-36300 #	
A87-36361 #	p 38
A87-36363 #	
A07-30303 W	
A87-36525 #	p 18
A87-36546 #	p 38
A87-36579 #	р6
A87-36757 #	p 38
A87-36925 #	•
A07-30823 #	•
A87-36933 # A87-36945 #	p 46
A87-36945 #	p 23
A87-36946 #	
	р6
A87-37054 #	р6
A87-37055 #	p 46
A07-37033 W	•
A87-37056 #	p 23
A87-37276 #	p 38
A87-37277 #	
A87-37278 *#	р6
A87-37279 *#	p 6
A07 07000 * "	
A87-37280 * #	p 13
A87-37281 *#	p 7
A87-37287 #	p 38
A87-37288 #	p 38
A87-37289 #	p 46
A87-37290 #	p 39
A87-37421 #	
	p 46
A87-37563 * #	p 23
A87-37564 #	p 23
A87-37565 #	p 23
A87-37801 #	p 39
	p 39
A87-37803 #	р 39
A87-37827 *#	•
MO1-31021 #	
A87-37886 #	p 24
A87-37918 #	p 15
	- 00
A87-37922 #	p 39
A87-38093 *#	p 46
A87-38093 * # A87-38094 * #	p 46 p 7
A87-38093 * # A87-38094 * # A87-38095 #	p 46
A87-38093 * # A87-38094 * # A87-38095 #	p 46 p 7 p 7
A87-38093 *# A87-38094 *# A87-38095 # A87-38096 *#	p 46 p 7 p 7 p 39
A87-38093 * # A87-38094 * # A87-38095 * # A87-38096 * # A87-38097 * #	p 46 p 7 p 7 p 39 p 7
A87-38093 * # A87-38094 * # A87-38095 * # A87-38096 * # A87-38097 * #	p 46 p 7 p 7 p 39 p 7
A87-38093 * # A87-38094 * # A87-38095 * # A87-38096 * # A87-38098 * #	p 46 p 7 p 7 p 39 p 7 p 39
A87-38093 * # A87-38094 * # A87-38095 # A87-38096 * # A87-38098 * # A87-38826 * #	p 46 p 7 p 7 p 39 p 7 p 39 p 24
A87-38093 * # A87-38094 * # A87-38095 * # A87-38096 * # A87-38098 * #	p 46 p 7 p 7 p 39 p 7 p 39
A87-38093 * # A87-38094 * # A87-38095 # A87-38096 * # A87-38096 * # A87-38096 * # A87-38826 * # A87-38831 #	p 46 p 7 p 7 p 39 p 7 p 39 p 24 p 24
A87-38093 ° # A87-38094 ° # A87-38095 # A87-38096 ° # A87-38096 ° # A87-38826 ° # A87-38831 # A87-38832 #	P 46 P 7 P 7 P 39 P 7 P 39 P 24 P 24 P 24
A87-38093 *# A87-38094 *# A87-38096 *# A87-38096 *# A87-38826 *# A87-38831 # A87-38833 #	p 46 p 7 p 7 p 39 p 7 p 39 p 24 p 24 p 24 p 24
A87-38093 *# A87-38094 *# A87-38096 *# A87-38096 *# A87-38826 *# A87-38831 # A87-38833 #	p 46 p 7 p 7 p 39 p 7 p 39 p 24 p 24 p 24 p 24
A87-38093 *# A87-38094 *# A87-38095 *# A87-38096 *# A87-38097 *# A87-38083 # A87-38832 # A87-38833 # A87-38833 #	p 46 p 7 p 7 p 39 p 7 p 39 p 24 p 24 p 24 p 24 p 24
A87-38093 * # A87-38094 * # A87-38095 * # A87-38096 * # A87-38096 * # A87-38826 * # A87-38832 # A87-38833 # A87-38835 # A87-38835 # A87-38835 # A87-38836 #	p 46 p 7 p 7 p 39 p 7 p 39 p 24 p 24 p 24 p 24 p 24 p 24 p 24
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38832 # A87-38835 # A87-38835 # A87-38837 * # A87-38837 * #	p 46 p 7 p 7 p 39 p 7 p 39 p 24 p 24 p 24 p 24 p 24 p 24 p 24
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38832 # A87-38835 # A87-38835 # A87-38837 * # A87-38837 * #	P 46 P 7 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 24 P 24 P 24
A87-38093 *# A87-38096 *# A87-38096 *# A87-38097 *# A87-38098 *# A87-38831 # A87-38832 # A87-38833 # A87-38836 *# A87-38836 *# A87-38837 *# A87-38839 *#	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 24 P 24 P 25
A87-38093 # A87-38096 * A87-38096 * A87-38096 * A87-38098 * A87-38831 # A87-38833 # A87-38833 # A87-38837 * A87-38837 * A87-38839 * A87-3889 * A87	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 24 P 25 P 25
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38833 # A87-38835 # A87-38836 # A87-38839 * # A87-38839 * # A87-38841 * * * * * * * * * * * * * * * * * * *	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 24 P 25 P 25
A87-38093 *# A87-38095 *# A87-38096 *# A87-38097 *# A87-38098 *# A87-38831 # A87-38833 # A87-38835 # A87-38836 *# A87-38837 *# A87-38840 *# A87-38841 *# A87-38841 *#	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 25 P 25
A87-38093 * # A87-38096 * # A87-38096 * # A87-38096 * # A87-38098 * A87-38831 # A87-38833 # A87-38835 # A87-38836 # A87-38837 * # A87-38840 * # A87-38841 # A87-38841 # A87-38841 # A87-38843 # A87-38843 # A87-38844 # A87-3884 # A87-8884 # A87-8884 # A87-8884 # A87-8884 # A87-8884 #	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 25 P 25 P 25
A87-38093  # A87-38096  # A87-38096  # A87-38096  # A87-38098  # A87-38831  # A87-38833  # A87-38835  # A87-38837  # A87-38837  # A87-38836  # A87-38837  # A87-38838  #	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 25 P 25
A87-38093  # A87-38096  # A87-38096  # A87-38096  # A87-38098  # A87-38831  # A87-38833  # A87-38835  # A87-38837  # A87-38837  # A87-38836  # A87-38837  # A87-38838  #	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 24 P 25 P 25 P 25
A87-38093  # A87-38096  # A87-38096  # A87-38096  # A87-38098  # A87-38831  # A87-38833  # A87-38835  # A87-38837  # A87-38837  # A87-38836  # A87-38837  # A87-38838  #	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 25 P 25 P 25 P 25
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38833 # A87-38835 # A87-38836 # A87-38839 * # A87-38840 * # A87-38846 * # A87-38847 * # A87-38846 * # A87-38846 * # A87-38846 * # A87-38846 * # A87-38847 * *	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 25 P 25 P 25 P 25 P 25 P 25 P 25 P 26
A87-38093 * # A87-38095 * # A87-38096 * # A87-38096 * # A87-38098 * A87-38831 # A87-38835 * # A87-38836 * # A87-38837 * # A87-38840 * # A87-38846 * * * * * * * * * * * * * * * * * * *	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 24 P 25 P 25 P 25 P 25
A87-38093 * # A87-38096 * # A87-38096 * # A87-38096 * # A87-38831 # A87-38833 # A87-38835 # A87-38836 # A87-38839 * # A87-38840 * # A87-38846 * # A87-38844 * A87-38844 * # A87-38844 # A87-38848 #	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 25 P 25 P 25 P 25 P 25 P 25 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38096 * # A87-38831 # A87-38833 # A87-38835 # A87-38836 * # A87-38836 * # A87-38840 * # A87-38841 * # A87-38846 * # A87-3884	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 25 P 25 P 25 P 25 P 25 P 25 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38835 # A87-38835 # A87-38836 * # A87-38840 * # A87-38846 * # A87-3884	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 25 P 25 P 25 P 25 P 25 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38096 * # A87-38831 # A87-38833 # A87-38835 # A87-38836 * # A87-38836 * # A87-38840 * # A87-38841 * # A87-38846 * # A87-3884	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 25 P 25 P 25 P 25 P 25 P 25 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38831 # A87-38835 # A87-38836 * # A87-38839 * # A87-38841 * A87-38846 * # A87-3884	P 46 P 7 P 39 P 7 P 39 P 24 P 24 P 24 P 25 P 25 P 25 P 25 P 25 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38831 # A87-38835 # A87-38836 * # A87-38839 * # A87-38841 * A87-38846 * # A87-3884	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 25 P 25 P 25 P 25 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38832 # A87-38835 * # A87-38839 * # A87-38843 * # A87-38843 * # A87-38844 * # A87-38846 * # A87-38846 * # A87-38848 # A87-38848 # A87-38848 # A87-38848 # A87-38847 # A87-38847 # A87-38847 # A87-38847 # A87-39179 # A87-39179 # A87-39179 # A87-39182 * *	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 25 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38832 # A87-38835 * # A87-38839 * # A87-38843 * # A87-38843 * # A87-38844 * # A87-38846 * # A87-38846 * # A87-38848 # A87-38848 # A87-38848 # A87-38848 # A87-38847 # A87-38847 # A87-38847 # A87-38847 # A87-39179 # A87-39179 # A87-39179 # A87-39182 * *	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 25 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38832 # A87-38835 # A87-38836 # A87-38836 * # A87-38840 * # A87-38840 * # A87-38846 * # A87-38846 * # A87-38847 # A87-38846 * # A87-38847 # A87-38847 # A87-38847 # A87-38847 # A87-38847 # A87-39179 # A87-39179 # A87-39189 * # A87-39189 * # A87-39189 * # A87-39182 * # A87-39183 # A8	P 46 P 7 P 39 P 39 P 24 P 24 P 24 P 25 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38096 * # A87-38831 # A87-38833 # A87-38835 * # A87-38836 * # A87-38836 * # A87-38836 * # A87-38846 * # A87-39187 * # A87-39187 * # A87-39187 * # A87-39188 * * * A87-39188 * A87-3918	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 24 P 25 P 25 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38833 # A87-38835 # A87-38836 * # A87-38839 * # A87-38846 * # A87-39187 * A87-39187 * A87-39187 * A87-39187 * A87-39188 * A87-39188 * A87-39188 * A87-39188 * # A87-39188 * * * A87-39188 * * * A87-39188 * A87-39	P 46 P 7 P 9 39 P 7 P 24 P 24 P 24 P 24 P 25 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38833 # A87-38835 # A87-38836 * # A87-38839 * # A87-38846 * # A87-39187 * A87-39187 * A87-39187 * A87-39187 * A87-39188 * A87-39188 * A87-39188 * A87-39188 * # A87-39188 * * * A87-39188 * * * A87-39188 * A87-39	P 46 P 7 P 39 P 7 P 24 P 24 P 24 P 25 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38832 # A87-38835 # A87-38836 * # A87-38836 * # A87-38846 * # A87-38846 * # A87-38847 * # A87-39187 * # A87-39188 * # A87-39188 * # A87-39188 # A87-39	P 46 P 7 7 P 9 39 P 7 P 9 24 P 9 24 P 9 24 P 9 25 P 9 25 P 9 26 P
A87-38093	P 46 P 7 P 39 P 7 7 P 24 P 24 P 24 P 24 P 25 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38835 # A87-38835 # A87-38836 * # A87-38837 * A87-38837 * A87-38846 * # A87-39187 * A87-39187 * A87-39187 * A87-39188 * A87-3918	P 46 P 7 P 9 39 P 24 P 24 P 24 P 24 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38835 # A87-38835 # A87-38836 * # A87-38837 * A87-38837 * A87-38846 * # A87-39187 * A87-39187 * A87-39187 * A87-39188 * A87-3918	P 46 P 7 P 9 39 P 24 P 24 P 24 P 24 P 25 P 25 P 26 P 26 P 26 P 26 P 26 P 26 P 26 P 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38096 * # A87-38831 * A87-38832 * A87-38835 * # A87-38835 * A87-38836 * # A87-38846 * # A87-39187 * # A87-39188 * # A87-39189 * # A87-39189 * * * * * * * * * * * * * * * * * * *	P 46 P 7 7 9 9 7 9 24 P P 24 P P 25 P P 25 P P 26 P P 27 P P 28 P
A87-38093	P 46 P 7 P 9 7 P 9 7 P 9 24 P 9 24 P 9 25 P 9 25 P 9 26
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38833 # A87-38835 # A87-38836 * # A87-38837 * # A87-38846 * # A87-38847 # A87-38846 # A87-39189 # A87-39189 # A87-39180 # A87-39190 # A87-	P 46 P 7 P 9 39 P 7 24 P 9 24 P 9 24 P 9 25 P 9 26 P 9 26 P 9 26 P 9 26 P 9 27 P 9 28 P 9 28
A87-38093 * # A87-38096 * # A87-38096 * # A87-38098 * # A87-38831 # A87-38833 # A87-38835 # A87-38836 * # A87-38837 * # A87-38846 * # A87-38847 # A87-38846 # A87-39189 # A87-39189 # A87-39180 # A87-39190 # A87-	P 46 P 7 P 9 39 P 7 24 P 9 24 P 9 24 P 9 25 P 9 26 P 9 26 P 9 26 P 9 26 P 9 27 P 9 28 P 9 28
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38831 # A87-38835 # A87-38835 # A87-38836 * # A87-38837 * A87-38839 * # A87-38846 * # A87-39186 # A87-39188 # A87-39188 # A87-39188 # A87-39188 # A87-39188 # A87-39189 # A87-39189 # A87-39199 * * * A87-39199 * * * A87-39199 * * * A87-39	P P P P P P P P P P P P P P P P P P P
A87-38093	P P 7 P P 39 P P 24 P P P P P P P P P P P P P P P P
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38833 # A87-38835 # A87-38836 * # A87-38836 * # A87-38836 * # A87-38846 * # A87-38847 * # A87-38846 * # A87-39187 * # A87-39188 * # A87-39188 * # A87-39188 * # A87-39189 * # A87-39189 * # A87-39199 * # A87-39191 * * * A87-39191	P P 7 P P 39 P P 24 P P P P P P P P P P P P P P P P
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38833 # A87-38835 # A87-38836 * # A87-38836 * # A87-38836 * # A87-38846 * # A87-38847 * # A87-38846 * # A87-39187 * # A87-39188 * # A87-39188 * # A87-39188 * # A87-39189 * # A87-39189 * # A87-39199 * # A87-39191 * * * A87-39191	P 46 P 7 7 9 9 7 9 24 P P 2 24 P P 2 24 P P 2 25 P P 2 26 P P P 2 26 P P P P P P P P P P P P P P P P P P P
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38835 # A87-38835 # A87-38836 * # A87-38836 * # A87-38836 * # A87-38836 * # A87-38846 * # A87-39189 * # A87-39180 * # A87-39190 * # A87-39	PP 7 7 9 7 9 7 9 7 24 4 4 6 7 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9
A87-38093	P P 7 P P 39 P P 24 P P P 25 P P P 26 P P P 8 P P P P P P P P P P P P P P P
A87-38093 * # A87-38096 * # A87-38096 * # A87-38836 * # A87-38835 # A87-38835 # A87-38836 * # A87-38836 * # A87-38836 * # A87-38836 * # A87-38846 * # A87-39189 * # A87-39180 * # A87-39190 * # A87-39	PP 7 7 9 7 9 7 9 7 24 4 4 6 7 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9

87-39468 #		N87-22319
\87-39593  # \87-39790  #		N87-22336
87-40244 *#	p8	N87-22364 N87-22373
\87-40246   # \87-40248 <b>*</b> #		N87-22382
\87-40248 °# \87-40249 °#		N87-22386
87-40250 *#	p 27	N87-22387 N87-22388
\87-40281   # \87-40289 °#		N87-22457
87-40301 °#	p 9	N87-23012
N87-40302 #	† p9	N87-23014 N87-23015
\87-40303 °# \87-40304  #		N87-23016
87-40308 #		N87-23018 N87-23032
\87-40309 *# \87-40379 *#		N87-23032
N87-40432 #		N87-23046
87-40433 #	p 27	N87-23102 N87-23103
\87-40434   # \87-40648 °#		N87-23104
N87-40756 #	p 47	N87-23558 N87-24009
\87-40768 * # \87-40770 * #		N87-24010
\87-40835 #	p 47	N87-24011
\87-40944 <b>*</b> #	p 9	N87-24012 N87-24013
\87-41068 # \87-41380 *#	p 28	N87-24014
<b>187-41383</b> #	פום י	N87-24031 1 N87-24032 1
\87-41428 # \87-41430 # \87-41432 #	p 9	N87-24043
\87-41430 #	p 9 p 47	N87-24061
\87-41434 #	p 9	N87-24493 N87-24593
\87-41435   # \87-41588   #		N87-24731
87-41771 #	p 10	N87-24733
N87-41925 #		N87-24734 N87-24735
\87-42255 #		N87-24736
87-42256 #	p 36	N87-24737 N87-24738
\87-42257   # \87-42628   #		N87-24739
\87-42637 #	p 28	N87-24740
87-42638 #		N87-24741 N87-24742
\87-42639 * # \87-42640 * #		N87-24743
107-42041 #	b 5a	N87-24744 N87-24745
\87-42642 °# \87-42643 °#		N87-24746
87-42644 *#	p 29	N87-24747
87-42645 *# 87-42646 *#		N87-24748 N87-24749
\87-42659 * #		N87-24750
		N87-24751 N87-24752
187-20449 *# 187-20554 *#		N87-24753
187-20618 #	p 16	N87-24754 N87-24755
187-20619 # 187-20621 #	_ 46	N87-24756
187-20622 #	p 48	N87-24757
187-20624 #	p 49	N87-24761 N87-24763
187-20626 # 187-20634 #		N87-24765
187-20635 #	p 30	N87-24766 N87-24767
187-20642 # 187-20659 #		N87-24768
187-20659  # 187-20710  #		N87-24769
I87-20716 #	p 30	N87-24771 N87-24773
187-21408 # 187-21474	p 10 p 49	N87-24775
187-21497	p 30	N87-24776 N87-24777
187-21521 187-21533 *#	p 49	N87-24777 N87-24780
187-21533 *# 187-21534 *#		N87-24781
87-21980 #	p 31	N87-24782 N87-24785
187-22278 # 187-222 <b>8</b> 0 #		N87-24788
187-22281 *#	p 49	N87-24789 N87-24791
187-22282 #	p 16	N87-24791 N87-24792
187-22286 # 187-22290 #		N87-24797
187-22290  # 187-22296 °#		N87-24798 N87-24799
187-22297 #		N87-24801

N87-22319 *#	p 19
N87-22336 #	p 10
N87-22364 #	p 36
N87-22373 # N87-22382 #	р 36 р 31
N87-22386 * #	p 31
N87-22387 # N87-22388 #	р 31 р 31
N87-22457 *#	p 50
N87-23012 # N87-23014 #	р 50 р 41
N87-23015 #	р 41 р 14
N87-23016 # N87-23018 *#	p 32 p 16
N87-23032 #	p 11
N87-23033 * # N87-23046	p 17 p 32
N87-23102 #	p 32 p 32
N87-23103 # N87-23104 #	p 32 p 32
N87-23558 *#	p 32 p 50
N87-24009 #	p 32
N87-24010 * # N87-24011 #	p 11 p 41
N87-24012 ° #	p 33
N87-24013 # N87-24014 #	p 41 p 41
N87-24031 *#	p 36
N67-24032 * # N67-24043 #	p 36 p 19
N87-24061 #	p 33
N87-24493 # N87-24593 #	p 57 p 11
N87-24731 #	p 33
N87-24733 * # N87-24734 #	p 11 p 50
N87-24735 *#	p 11
N87-24736 * # N87-24737 * #	p 11 p 12
N87-24738 #	p 50
N87-24739 * # N87-24740 #	p 51 p 51
N87-24741 #	p 51 p 42
N87-24742 #	p 51
N87-24742 # N87-24743 # N87-24744 #	p 51 p 51
N87-24745 #	p 51
N87-24747 #	р 51 р 14
N87-24748 #	p 52
N87-24749 # N87-24750 #	p 52 p 52
N87-24751 #	p 52
N87-24752 # N87-24753 #	p 52 p 42
N87-24754 #	p 42
N87-24755 # N87-24756 *#	p 52 p 53
N87-24757 #	p 53
N87-24757 # N87-24761 # N87-24763 #	p 53 p 53
N87-24765 #	p 53
N87-24766 # N87-24767 #	р 33 р 53
N87-24768 #	p 53
N87-24769 # N87-24771 #	p 54 p 54
N87-24773 #	p 54
N87-24775 # N87-24776 #	p 54 p 54
N87-24777 #	p 57
N87-24780 # N87-24781 #	p 57 p 54
N87-24782 #	p 54
N87-24782 # N87-24785 # N87-24788 #	p 54 p 55
N87-24789 #	p 55
N87-24791 # N87-24792 #	p 42 p 55
N87-24797 #	p 57
N87-24798 #	p 55
N87-24799 # N87-24801 #	p 42 p 12

ACCESSION NUMBER INDEX

# N87-24804

N87-24804	#	p 42
N87-24808	#	p 42
N87-24811	#	p 55
N87-24812	#	p 55
N87-24813	#	p 55
N87-24814	#	p 43
N87-24815	#	p 55
N87-24816	*	p 33
N87-24817		p 43
N87-24870 1	*	p 33

# **AVAILABILITY OF CITED PUBLICATIONS**

# IAA ENTRIES (A87-10000 Series)

Publications announced in *IAA* are available from the AIAA Technical Information Service as follows: Paper copies of accessions are available at \$10.00 per document (up to 50 pages), additional pages \$0.25 each. Microfiche of documents announced in *IAA* are available at the rate of \$4.00 per microfiche on demand. Standing order microfiche are available at the rate of \$1.45 per microfiche for *IAA* source documents and \$1.75 per microfiche for AIAA meeting papers.

Minimum air-mail postage to foreign countries is \$2.50. All foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to: Technical Information Service, American Institute of Aeronautics and Astronautics, 555 West 57th Street, New York, NY 10019. Please refer to the accession number when requesting publications.

# STAR ENTRIES (N87-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code preceded by the letters HC or MF in the STAR citation. Current values for the price codes are given in the tables on NTIS PRICE SCHEDULES.

Documents on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the \*symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

<sup>(1)</sup> A microfiche is a transparent sheet of film. 105 by 148 mm in size containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26.1 reduction)

- Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)
- Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.
- Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on the page titled ADDRESSES OF ORGANIZATIONS.
- Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie. Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).
- Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House. Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.
- Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration. Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.
- Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.
- Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of \$1.50 each, postage free. (See discussion of NASA patents and patent applications below.)
- Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.
- Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.
- Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

# **PUBLIC COLLECTIONS OF NASA DOCUMENTS**

**DOMESTIC:** NASA and NASA-sponsored documents and a large number of aerospace publications are available to the public for reference purposes at the library maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service. 555 West 57th Street, 12th Floor, New York, New York 10019.

**EUROPEAN:** An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and from ESA — Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15. France.

# FEDERAL DEPOSITORY LIBRARY PROGRAM

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 50 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 50 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover. These libraries are *not* sales outlets. A local library can contact a Regional Depository to help locate specific reports, or direct contact may be made by an individual.

# STANDING ORDER SUBSCRIPTIONS

NASA SP-7041 and its supplements are available from the National Technical Information Service (NTIS) on standing order subscription as PB 86-903800 at the price of \$14.50 domestic and \$29.00 foreign. Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.

# ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics Technical Information Service 555 West 57th Street, 12th Floor New York, New York 10019

British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England

Commissioner of Patents and Trademarks U.S. Patent and Trademark Office Washington, D.C. 20231

Department of Energy Technical Information Center P.O. Box 62 Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service ESRIN Via Galileo Galilei 00044 Frascati (Rome) Italy

ESDU International, Ltd. 1495 Chain Bridge Road McLean, Virginia 22101

ESDU International, Ltd. 251-259 Regent Street London, W1R 7AD, England

Fachinformationszentrum Energie, Physik, Mathematik GMBH 7514 Eggenstein Leopoldshafen Federal Republic of Germany

Her Majesty's Stationery Office P.O. Box 569, S.E. 1 London, England

NASA Scientific and Technical Information Facility P.O. Box 8757 B.W.I. Airport, Maryland 21240 National Aeronautics and Space Administration Scientific and Technical Information Division (NTT-1) Washington, D.C. 20546

National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

Pendragon House, Inc. 899 Broadway Avenue Redwood City, California 94063

Superintendent of Documents U.S. Government Printing Office Washington, D.C. 20402

University Microfilms A Xerox Company 300 North Zeeb Road Ann Arbor, Michigan 48106

University Microfilms, Ltd. Tylers Green London, England

U.S. Geological Survey Library National Center - MS 950 12201 Sunrise Valley Drive Reston, Virginia 22092

U.S. Geological Survey Library 2255 North Gemini Drive Flagstaff, Arizona 86001

U.S. Geological Survey 345 Middlefield Road Menlo Park, California 94025

U.S. Geological Survey Library Box 25046 Denver Federal Center, MS914 Denver, Colorado 80225

# **NTIS PRICE SCHEDULES**

(Effective January 1, 1987)

# Schedule A STANDARD PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	PAGE RANGE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	Microfiche	\$ 6.50	\$13.00
A02	001-025	9.95	19.90
A03	026-050	11.95	23.90
A04-A05	051-100	13.95	27.90
A06-A09	101-200	18.95	37.90
A10-A13	201-300	24.95	49.90
A14-A17	301-400	30.95	61.90
A18-A21	401-500	36.95	73.90
A22-A25	501-600	42.95	85.90
A99	601-up	•	•
NO1	·	45.00	80.00
NO2		48.00	80.00

# Schedule E EXCEPTION PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
E01	\$ 7.50	15.00
E02	10.00	20.00
E03	11.00	22.00
E04	13.50	27.00
E05	15.50	31.00
E06	18.00	36.00
E07	20.50	41.00
E08	23.00	46.00
E09	25.50	51.00
E10	28.00	56.00
E11	30.50	61.00
E12	33.00	66.00
E13	35.50	71.00
E14	38.50	77.00
E15	42.00	84.00
E16	46.00	92.00
E17	50.00	100.00
E18	54.00	108.00
E19	60.00	120.00
E20	70.00	140.00
E99	•	•

\*Contact NTIS for price quote.

# **IMPORTANT NOTICE**

NTIS Shipping and Handling Charges
U.S., Canada, Mexico — ADD \$3.00 per TOTAL ORDER
All Other Countries — ADD \$4.00 per TOTAL ORDER

Exceptions — Does NOT apply to:
ORDERS REQUESTING NTIS RUSH HANDLING
ORDERS FOR SUBSCRIPTION OR STANDING ORDER PRODUCTS ONLY

NOTE: Each additional delivery address on an order requires a separate shipping and handling charge.

1. Report No.	2. Government Access	sion No.	3. Recipient's Catalog	No.
NASA SP-7041 (55)				
4. Title and Subtitle			5. Report Date	
EARTH RESOURCES			November, 1987	,
A Continuing Bibliography (Issue 55)		Γ	6. Performing Organiza	ation Code
7. Author(s)			8. Performing Organiza	ation Report No.
•				
		<b>-</b>	10. Work Unit No.	
9. Performing Organization Name and Address				
National Aeronautics and Space Admir	nistration	-	11. Contract or Grant N	lo.
Washington, DC 20546			n. Contract of Grant N	·O.
			13. Type of Report and	Period Covered
12. Sponsoring Agency Name and Address				
		-	14. Sponsoring Agency	/ Code
				<del> </del>
15. Supplementary Notes				
16. Abstract				
This bibliography lists 368 reports, ar				
information system between July 1 a				
and geophysical instrumentation in s				
areas. Subject matter is grouped ac				
sources, geodesy and cartography,	geology and mine	ral resources, hydrolog	y and water mana	agement, data
processing and distribution systems,	instrumentation and	d sensors, and ecomon	ic analysis.	
				1
17. Key Words (Suggested by Authors(s))		18. Distribution Statement		
		18. Distribution Statement Unclassified - Unlin	nited	
17. Key Words (Suggested by Authors(s)) Bibliographies Earth Resources			nited	
Bibliographies			nited	
Bibliographies Earth Resources			nited	
Bibliographies Earth Resources			nited	
Bibliographies Earth Resources Remote Sensors	20 Security Classif (	Unclassified - Unlin		22 Price *
Bibliographies Earth Resources	20. Security Classif. ( Unclassified	Unclassified - Unlin	nited  21. No. of Pages 116	22. Price * A06/HC